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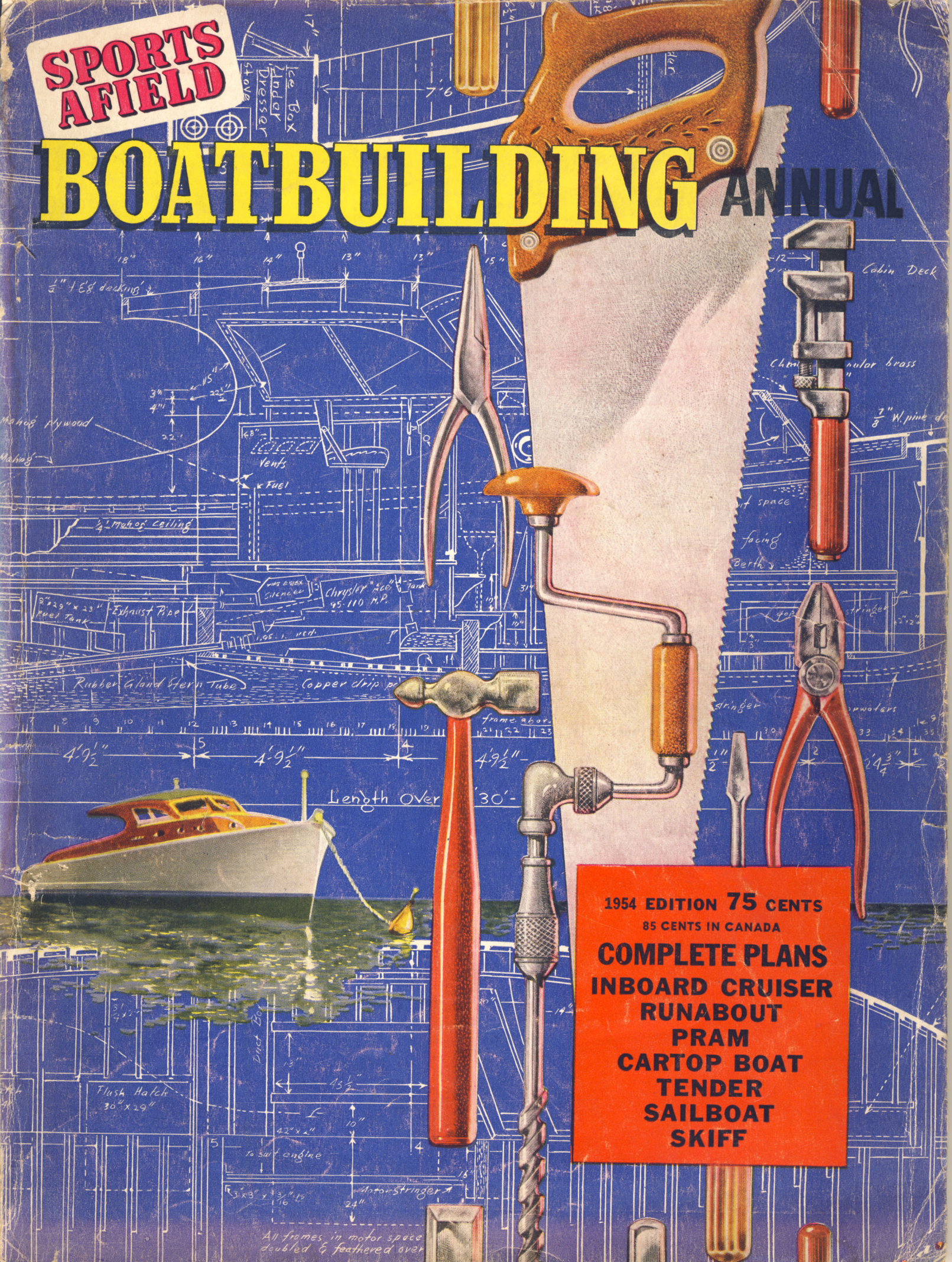

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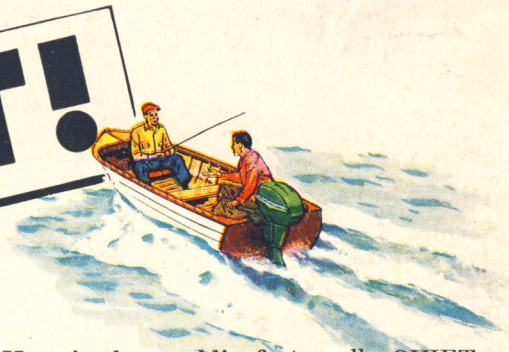

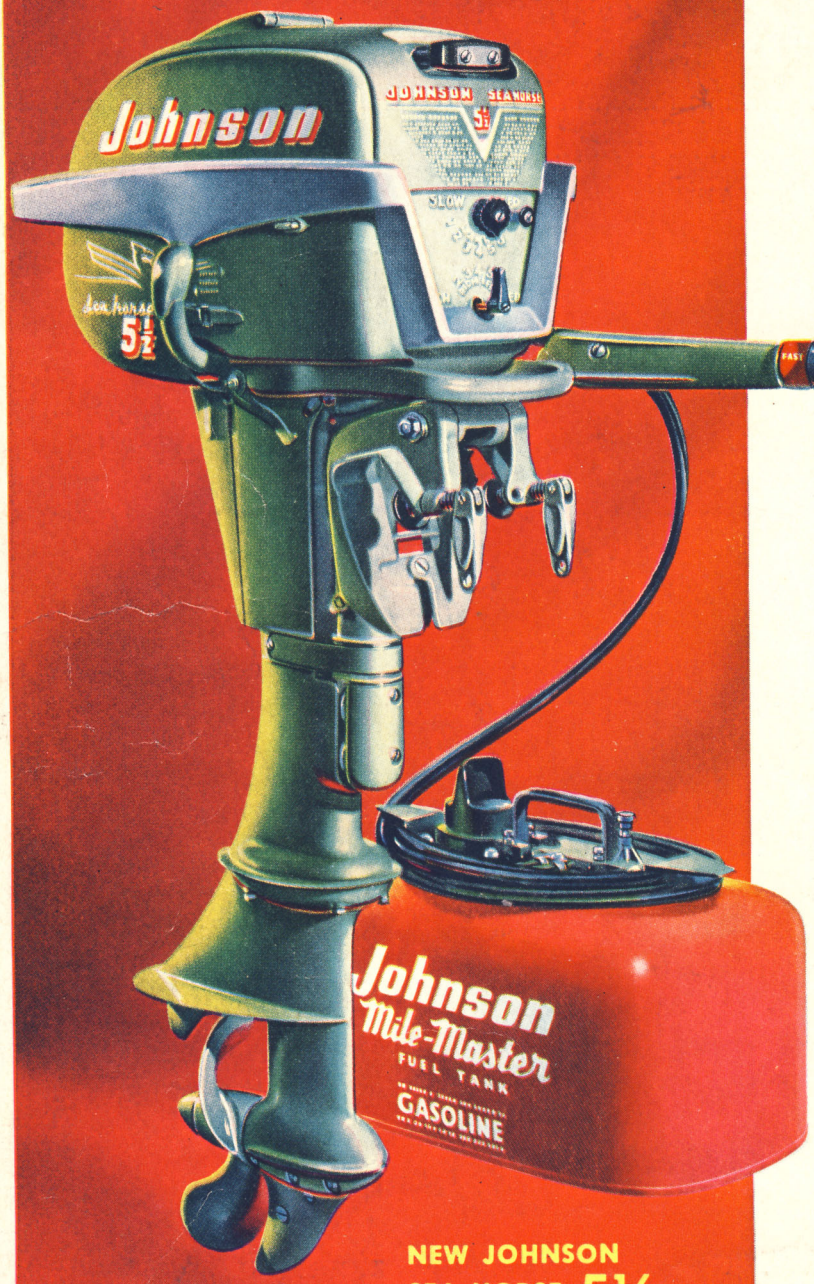

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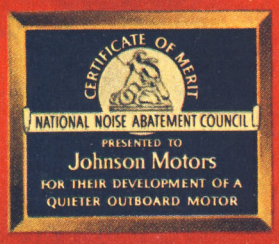

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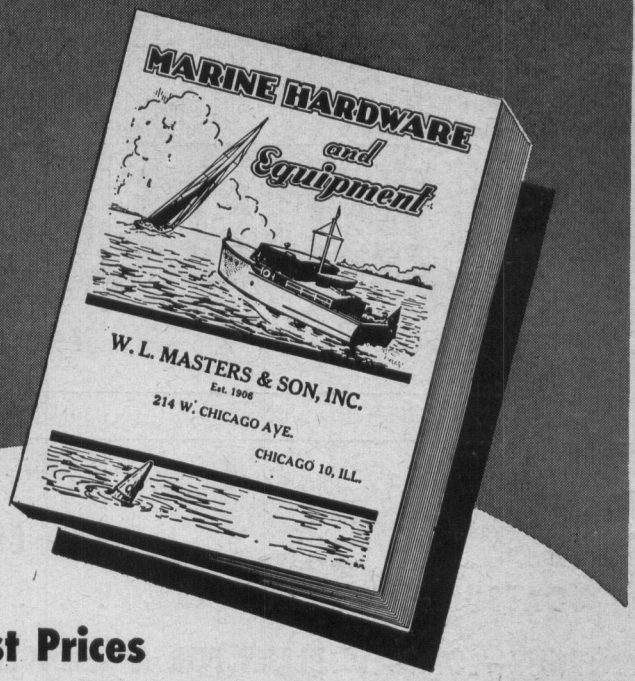

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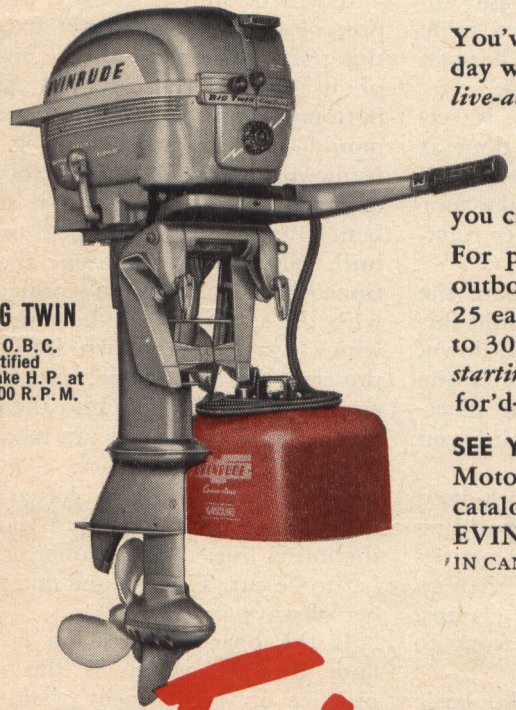

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BOATBUILDING PRINCIPLES

By WESTON FARMER

ANYTHING that you understand thoroughly is always fairly simple. This is true of boatbuilding.

Understand the basic principles of getting out a hull, and you'll be pretty sure of coming up with reasonably good methods of getting the job done. And once you've built *one* boat, the principles will dawn on you. Then you can tackle almost any boat. But it does take work, and it does take mechanical horse sense.

Mechanical horse sense is something no written word can supply. You're either born a mechanic or you're not. If you are mechanically gifted, you can do well building a boat. But if you have no gift for working with your hands, you shouldn't try boatbuilding. If you can get good cuts with plane, saw, and chisel, you can attempt to make a boat with reasonable assurance of success. Thousands do it every year.

Once your first boat is built, you'll have the principles of boatbuilding. And after the first one, nothing seems to be too big or too tough for the skilled amateur to tackle.

The fun of building a boat satisfies something primitive in man. And after launching his first boat, the backyard boatbuilder can go about dreaming up the next one, for he will have assimilated boatbuilding principles. These principles are few in number and can be easily illustrated and made clear.

Boatbuilding is the process of fabricating wood, steel, aluminum or plastics into the vessel designed by the naval architect. The builder's problem is to construct the vessel to the size and shape the designer depicts in his drawings. Highly important is this shape.

To get your boat fair and the correct size, you must first prepare a full size drawing of the lines and the main members (keel, stem, transom, knees) on the shop floor. Then these members may be transferred to the actual timber to be cut.

This process of laying down the lines is called *lofting*. The process of fairing up all sections and correcting obvious errors in the architect's scaling is called *fairing*. Fairing is done by moving a line here and there so that all cross sections jibe.

Boats are drawn on a scale of 1/16 full size, or 1/12 full size, or on other scales. So many inches or fractions of an inch equal a foot. In preparing the table of measurements by which the builder re-constructs the drawing full size—the table of offsets—the architect must scale his drawing, take a reading and letter the dimension.

This human transmission is subject to error. The width of an ink line in most drawings when multiplied 16 times in a loft layout can become half an inch off on a loft drawing, maybe more. The fairing process uses the offset table to "box in" all mechanical errors such as this, and of course obvious ones like the architect's getting the right dimension in the wrong offset table column. That can and does happen to the best of naval architects.

The correction of errors is secondary, however. Lofting is done as a convenience for the builder; from your faired drawings you make your full size parts without further reference to printed dimensions.

Your next step is to prepare the rigid framework which will hold this full sized shape you have laid down, until all structural elements of the hull have been fastened in place. At the completion of planking you have a hull.

At this point any falsework used to preserve the shape while building is discarded. The hull is now a structure in its own right. Into it then go the pieces of wood such as clamps, flooring, cabin and joiner work to complete the job.

To sum up, here are the basic steps in boatbuilding: the lofting and fairing out to full size, next the construction of the "building jig," termed a mold, in round-bottom boats, and a frame in V-bottom boats. Then the planking, and final installation of joiner work.

Lofting is done on either a painted shop floor, which is most usual in good boat shops, or the lofting job can be done on brown paper scotch-taped to a floor. The baseline for the station lines is usually drawn in with a long straight edge, or snapped with a chalk line. The curves are put in with battens, either nailed to the floor or held in place by weights. Good lofting is the inescapable first step. Try to dodge this part of the work—the first step—and you're in for trouble.

Once your boat is lofted, and the sections have been faired, the next thing you do to these sections is to subtract the planking thickness from the section lines. The mold sections for a bent-frame, round-bottom boat will be made from this inner set of body sections. So also will the sawn frames for a hard chine or V-bottom boat.

It will be well to get this distinction of terminology firmly fixed at this point. When *molds* are spoken of, it is in reference to the round-bottomed construction: a mold or mould—spelled either way—is the framework around which ribbands of wood are fastened so that steam bent frames can be shaped to the hull. When the word *frame* is mentioned it is usually in connection with the setup for a V-bottom boat which usually uses sawn frames to preserve the hull shape, and which are usually built right into the hull, *not* being discarded, as are molds.

WHEN your boat is lofted and faired, your next step is to transfer the lofted lines to the lumber or timber to be cut. This is done in a number of ways.

If the boat is lofted on a shop floor directly, which is the usual practice in good yacht yards, the shape of the stem, keel, and sections is transferred to template lumber so the outline can be sawed to. This template lumber is usually about ⅜" thick.

The lines can be transferred a number of ways. Old-time journey-

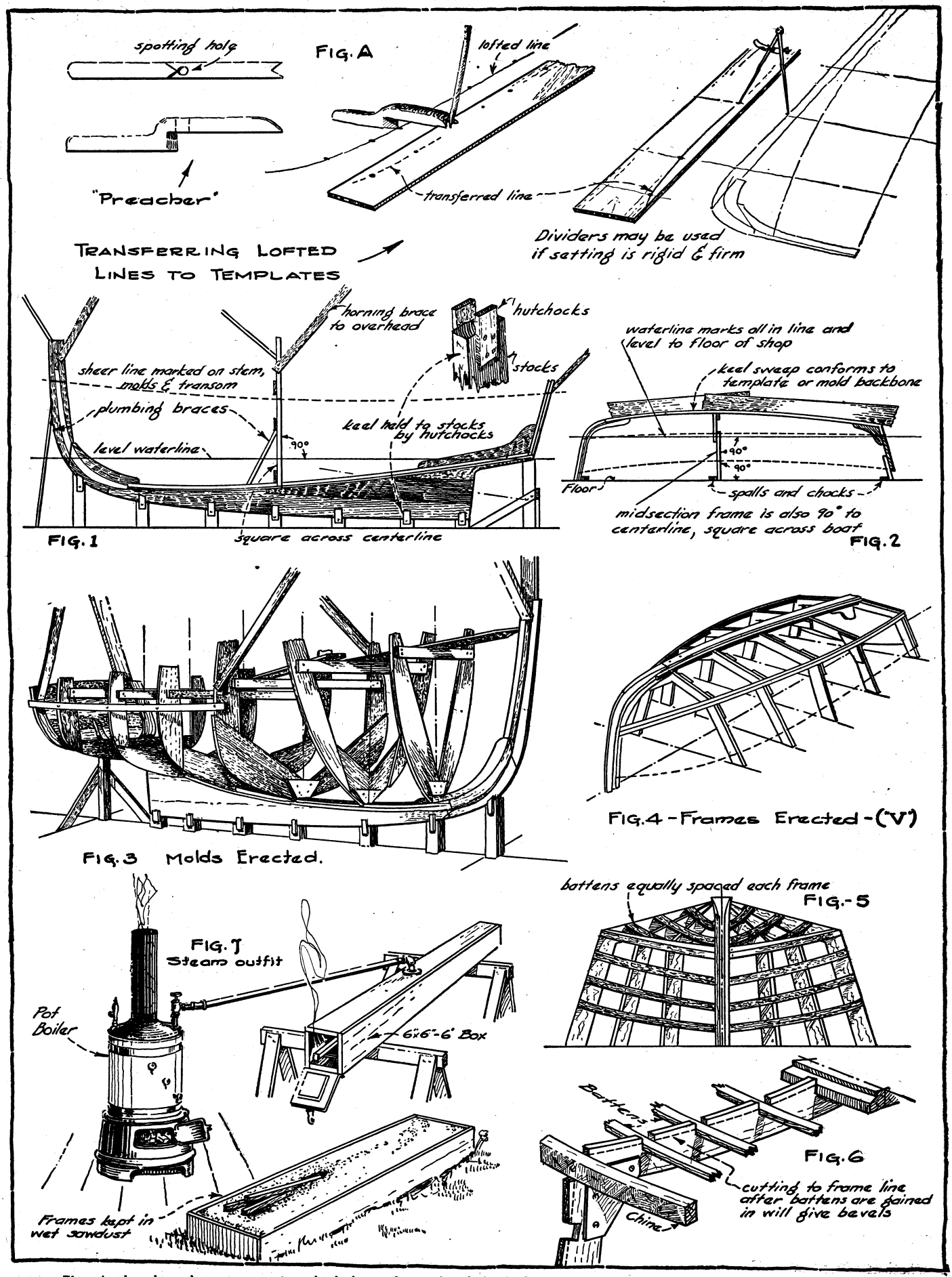


Fig. A sketches the manner in which lines from the lofted drawing may be transferred to templates. Fig. 1 shows the keel and stem for a husky round bilged craft as set up on stocks and hutchocks. Fig. 6 shows how frame bevels in a seam-and-batten job can be easily cut right on the frame after it is set up.

men boatbuilders use a "preacher" for this. See Fig. A, which explains the principle. Dividers can be used, as also shown, but a preacher is preferable as the dimension from heel to toe is fixed. A divider must be very rigidly set or it will creep, resulting in baffling errors. After the points are transferred from drawing to template, join the points and draw in the mating line.

Another transferring method is the use of nailheads set along the loft line, but this method is good only in the hands of excellent mechanics. (See Fig. 7 in another story, *How To Understand Boat Drawings).* The nailheads are tamped into the floor with a hammer, and the timber for the knee or other part is laid over these nailheads. By tamping the timber in turn, the outline of the part can be impressed in the timber, all points connected by a line, and sawed to.

One advantage of lofting on paper is that you can transfer shaped parts directly through the paper using a brad awl, or a dressmaker's wheel (See Fig. 4 in the story *How Prams Are Built).* Another advantage of lofting on heavy paper is that it is often possible for you to loft a 30-footer in a 15-foot room by doing the forward half first, then the aft half of the boat, using a short midsection to connect the faired ends.

The *disadvantage* of paper is that it creeps, and in some cases will shrink in one direction and expand in another. Not too serious if you watch for it.

With the stem cut out to rough shape, and likewise the keel, do you have the woodworking skill to cut the subsequent rabbet and taper the proper bevels? If these details of tool usage are not familiar, you might get a copy of Cliff Bradley's *Building the Small Boat.* That book deals with *method,* and we are talking of basic *principles* here.

Once the backbone elements of stem, keel, apron, transom, etc. are got out, most of the heavy "noodling" is over and the battle is half won. The next step after lofting and cutting of major parts is this: erect and hold in place the mold, in the building of a round-bottom boat, or the frame in the case of a V-bottom. There are dozens of ways to do this.

First, let us run through the mold erection of a round-bottom hull, and then later come back to the V-bottom system.

In the drawing, Fig. 1, the preliminary erection of the backbone and the midship mold has been carried out. All planes about which a hull is shaped are aligned: The keel, stem, and the transom are plumb in the vertical plane. The waterline is level to the loft floor. The keel has been set on stocks which extend at each section point the dimension necessary to reach the floor, or baseline. The midsection or midship mold has been "plumbed and horned." This term means that all is fair and square.

Plumbing of the molds means that they stand 90 degrees to baseline and to waterline. Also, that the centerline is actually plumb above the keel. Horning means that the mold is square athwartship. Plumbing and horning means that all planes are at 90 degrees—all square—and that the mold is level and without twist, or, as boatbuilders call it, "sny."

THE preliminary mold set up at Fig. 1 is then filled out as at Fig. 3. This view shows the molds erected, plumbed and horned, ready to have the ribbands fastened in place. The fastening of the ribbands is called *streaming*—a term used by boatbuilders to lay a thing in fair so it flows about the hull shape. The ribbands are streamed in at about six- to 12-inch spacing. It is about these that the frames are steam bent.

A word later about steam bending, but first notice that the keel of our boat is supported on stocks, and is kept from traveling off the stocks by cheek pieces which a boatbuilder calls *hutchocks.* Stocks can be toenailed to the shop floor, or cleated down. Or if the boat is built outdoors as can be done in a dry climate, stocks are simply driven into the ground and lopped off at proper height by template. The hutchocks prevent movement due to pounding, climbing and clamping down of frames.

Fig. 8 shows how the frames of steam-bent oak are bent into a hull mold. This view shows the use of the ribbands in helping to clamp the steam-bent frame in shape. Fig. 9 shows the Fig. 3 job pretty well along in construction: The frames have been bent in about the ribbands, the garboard plank next to the keel has been secured in place.

Next, the sheer strake has been secured and the hull has been planked down toward the turn of the bilge. A strake has been left out just above the garboard strake. This is called the *broad* in boatbuilding parlance. It is usually left out until the hull is closed in because this makes cleaning out chips and shavings thereby much easier.

As the planking progresses, the last plank put in is called the *shutter.* Often this is called the *whisky plank* for no better reason than in some yards the bottle of grog is passed and all hands take a pull.

Fig. 9 shows sufficient progress for the beginner to grasp the procedure from the sidewalk superintendent's point of view. The hull is, of course, planked out, planed, then caulked, sanded and primed with the first coat of paint. That covers the basic procedure on round-bilged hulls. The molds, of course, are not necessary now, and one by one are pulled out as the interior building goes along.

When you come to bending the frames, blessed are the uses of steam! The professional boatbuilder who can call himself a journeyman will always prefer to build a round-bilged hull because for him it is easier. He can make that useful tool, the steam box, say "Uncle." Those who have not used steam will shy away from it, preferring to build the more obvious built-in frame of the V-bottom type. Fortunately, no two men think alike on boatbuilding matters, which keeps the game changing. But you'll find that among men who have actually earned their living at the trade of boatbuilding, the preference is for bent frames—the molds don't have to be faired and bevelled to such accuracy, and the ribbands fair the job in. Also the steam-bent frames almost always bevel themselves in so that preparation for planking takes less time. So, a word about steam bending. There is no mystery about it—anyone who can boil oatmeal can do it.

Steam bending is merely the art of getting wood hot, and *wet* heat is best. Usually oak that is cut green and sized and stored in wet sawdust will be best. Air-dried oak, if soaked, can be used, but sometimes may fracture. Kiln dried wood is no good at all.

The steaming process is simple: a wood box, reasonably steam-tight is prepared. Into this is piped steam at atmospheric pressure. The frames are put into the steam box, and the steam gets the frames hot. One by

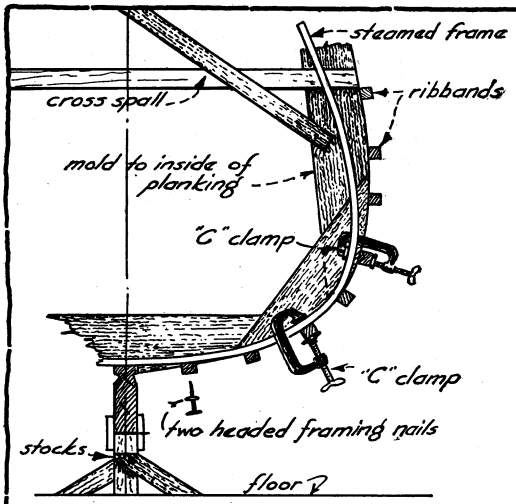
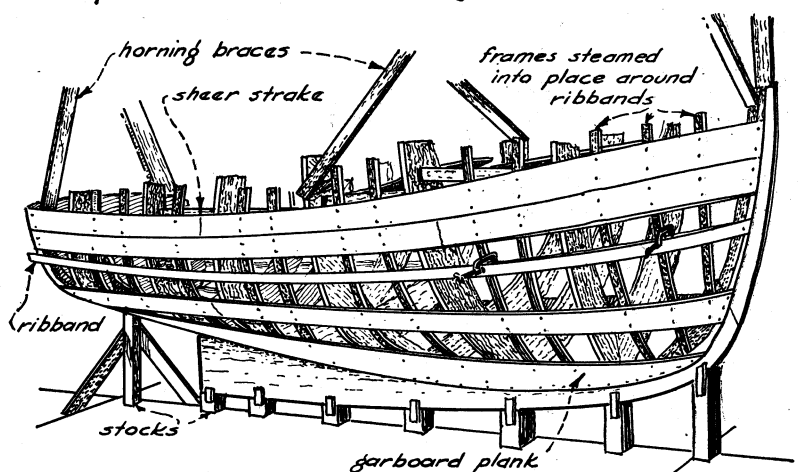
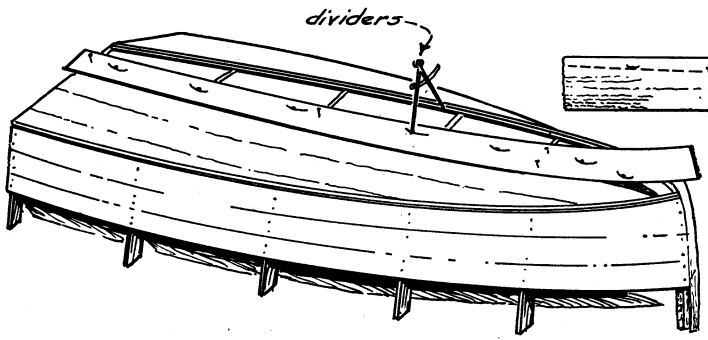


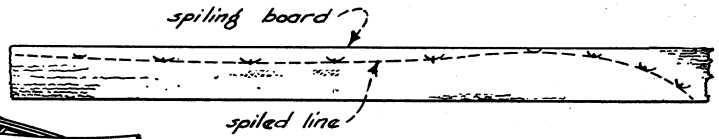
Fig. 8 - Steam Bent Frame

Fig. 9 - Framed and Partially Planked



Ribbands are removed as planking progresses

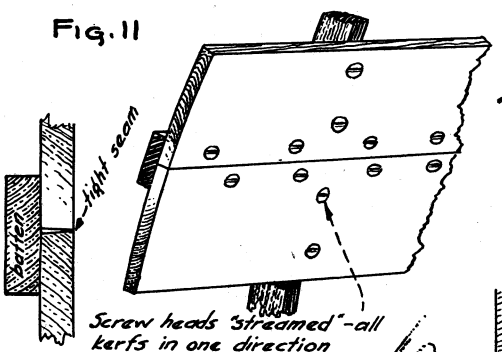




The spiling points are connected by a fair line. The resulting outline gives true shape for plank.

Fig 10 - Taking a "Spiling"

Fig. 11



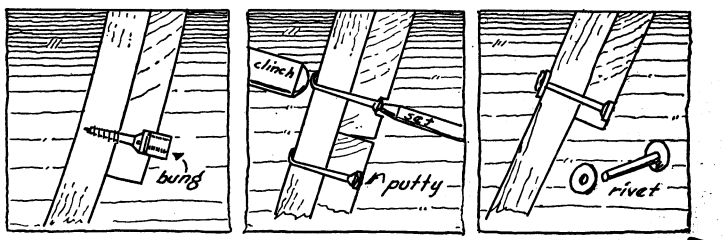


Fig. 12 - Types of Plank Fastenings

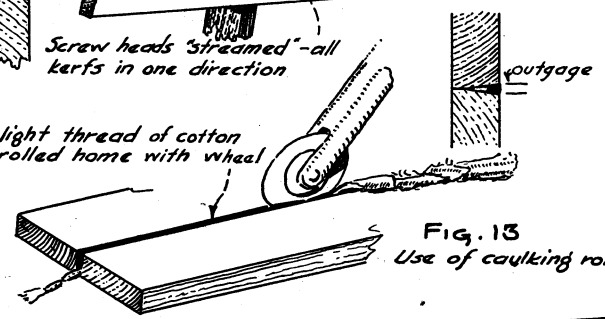


Fig. 13
Use of caulking roller

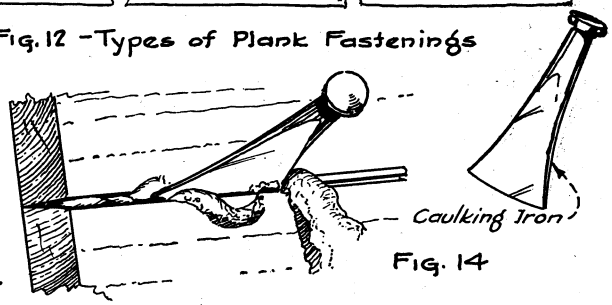


Fig. 14

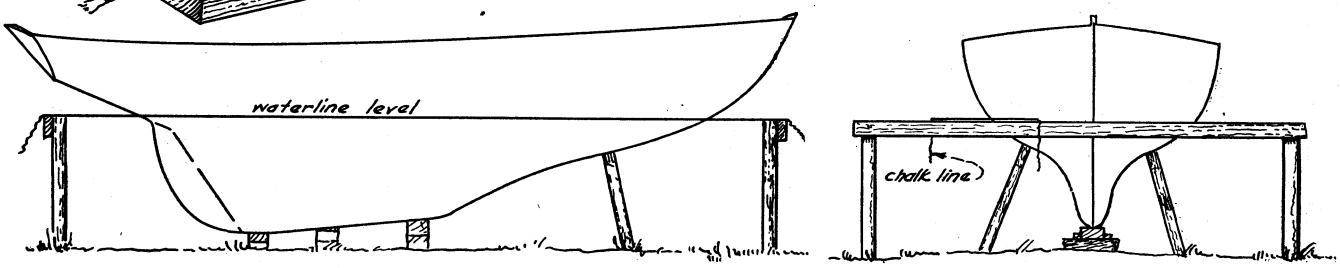


Fig. 15 – Showing use of batter boards and chalk line to strike in waterline

After the molds are set up, ribbands are streamed from stem to transom as shown in Fig. 8. Clamps are used to bring the steamed frame out to the ribbands and the frames are held to the ribbands during planking by two-headed framing nails. Fig. 10 graphically shows the principle of "spiling" a plank so it will fit.

one they are snaked out and rapidly bent into place, nailed or screwed to the keel, clamped to the ribbands as they are bent, and, with considerable overbend in them, they are allowed to cool back into place.

Wood that would flay a mule becomes rubbery and docile. Working with leather gloves and speedily fastening in, a crew of two or three men can frame out a 30-foot cruiser in one day. I have repeatedly framed out a 16-foot rowboat alone in my shop in half a day.

When I learned the trade many years ago, it was usual to apportion the work on a piecework basis—in clinker boatbuilding we got eight dollars for planking the boat, four for framing, four for trimming out. Bending the frames was the money-making end of it. It went fast.

Boiling will often do as well for frames up to 1" x 1", but above that steaming is better because it is hotter.

The outfit I use in my shop is shown in Fig. 7. A small boiler holding a few pails of water will steam up a batch of frames from a cold start in 45 minutes. And I think it much better than pipes filled with water and buried in a fire, or a teakettle over a blowtorch as recommended by some. Still, any steam is better than no steam at all.

The methods of securing joiner work usually appear in the designer's drawings. So having dispensed with the basic principles of producing a round-bilged hull, let us now return to the comparable steps in producing a V-bottom hull. See Fig. 2.

This shows the usual preliminary shop erection for an average sized V-bottom boat. Note that the basic condition of framing is being observed here: The keel is set up so that it is in line in the vertical plane, the midship mold is in place to satisfy plumbing and horning conditions. You may see all sorts of variations of these floor or stock setups. But just bear in mind that all of them are a means to one end: to preserve the planes in correct relationship to each other.

Fig. 4 shows the frames for the V-bottom boat set up and in the same comparable condition as the round-bilged job in Fig. 3. The beginner will note that these frames are sawn to shape to the inside of the planking. Also that the chine piece has been streamed in, fastened and trimmed to proper bevel for planking.

In a V-bottom boat, the next step is usually to cut the *gains* into the frame for the battens. Let's get the terminology of this right: Designers who have never built a boat sometimes refer to the gains as "notches" or "pockets," thereby confusing the uninitiated. A notch is something you cut in your gun when you kill a man dead, or something you cut in the wale of your boat to mark where you dropped the fishpole overboard. I suppose a "pocket" properly goes with pants, but it does not mean mortise. That is something different.

A mortise is a blind hole in joiner work, usually oblong or square, into which a tenon of wood is glued. But any cut through a piece of wood to allow another to pass through it is called a "gain" and is so referred to by anyone who has served an old-fashioned apprenticeship with tools.

The gains for the seam battens in a V-bottom boat are usually divided or so spaced on the frames as to give each plank equal width. That is, on the mid-section frame the spacings are all equal, but greater than they would be forward where the distance from chine to keel is less. The seam batten size will be nominated by the designer.

Fig. 6 shows a good dodge for producing evenly sunk batten gains and securing the proper frame bevels: don't saw the raw frame down to the exact frame line, but allow a little stock out beyond the final trim line. The gains are sunk to an exact proper depth, then the battens are streamed into the gains, and fastened down with the usual one screw per gain through the batten into the frame. When the battens are sunk home, the frame can be bevelled very easily by planing off the excess wood. The run and flow of the battens will clearly show the bevel without recourse to complicated lofting.

As in most boats, the garboard plank is fastened on first in the V-bottom. This plank is a great stiffener. From the garboard, the hull is planked out to the chine, and from the chine up. There is little need to skip about in planking the V-bottom. The battens stiffen the frame sufficiently.

How is the shape of each plank obtained? How are planks fastened? What keeps the seams tight? These are usually the questions asked after the round-bilge frame and the V-bottom frame principles are understood.

The shape of each plank is obtained by *spiling*. This is the name for the mechanical process of determining the run of the seam edge on a twisted, or snyed plank and converting this seam run to the flat board from which the plank will be cut.

It is obvious that you cannot just cut a straight edge in a piece of lumber, call it a plank, and then slap it on a hull and expect it to fit. The plank has sny to it, and a straight edge will, when the plank is fastened down, take a violent sweep up or down.

In Fig. 10, I have taken the planked V-bottom boat for simplicity of illustration. You will notice that a thin sheet of template lumber, usually about ⅛ to 3/16 or ⅜, has been tacked down flat to the sny or twist of the hull. This template sheet is straight on a flat surface, but when bent will sweep as shown. Use dividers, rigidly set, to transfer a fixed distance from the edge of the rabbet to the spiling template.

When you remove the template, join the points by a line which will have what appears to be a peculiar sweep. Then tack this spiling template on the plank lumber and saw out the spiled line. When planed, you have the garboard plank to just the right shape that will bend over the hull and fit the rabbet landing. Usually one or two initial tries will enable the novice to get the hang of the thing.

On round-bilged hulls, all planks are spiled. On V-bottom hulls, after the garboard is screwed home, the distance from the seam edge to the middle of the next batten will serve as a guide for initial fitting, but if you want to get your shape right the first time, spile 'er.

USUALLY the V-bottom boat is screw fastened. This is done either by running the screws flush to plank face and planing afterward, which is Fancy Dan stuff for bright finished boats, or by countersinking about ⅛" as the screw is driven, plugging with white lead putty or some patented seam gunk before sanding.

In high quality boats, such as mahogany runabouts, the screw hole is counterbored for mahogany bung plugs. These are wooden dowels of the same wood as the planking and about ½" long. Dipped in shellac, with the grain running with the plank, they are softly tapped home and the shellac allowed to harden before the bung is clipped flush to plank with a sharp chisel. Bungs can be bought in all sizes from marine supply houses. Here also you can buy drills that will pre-drill for screws and countersink for bungs all in one go.

Invariably the screws in all boat construction must be pre-drilled to the root diameter of the screw, and from ½ to a full ¾ of screw length to avoid splitting. A split from a driven screw is a leak that's hard to find.

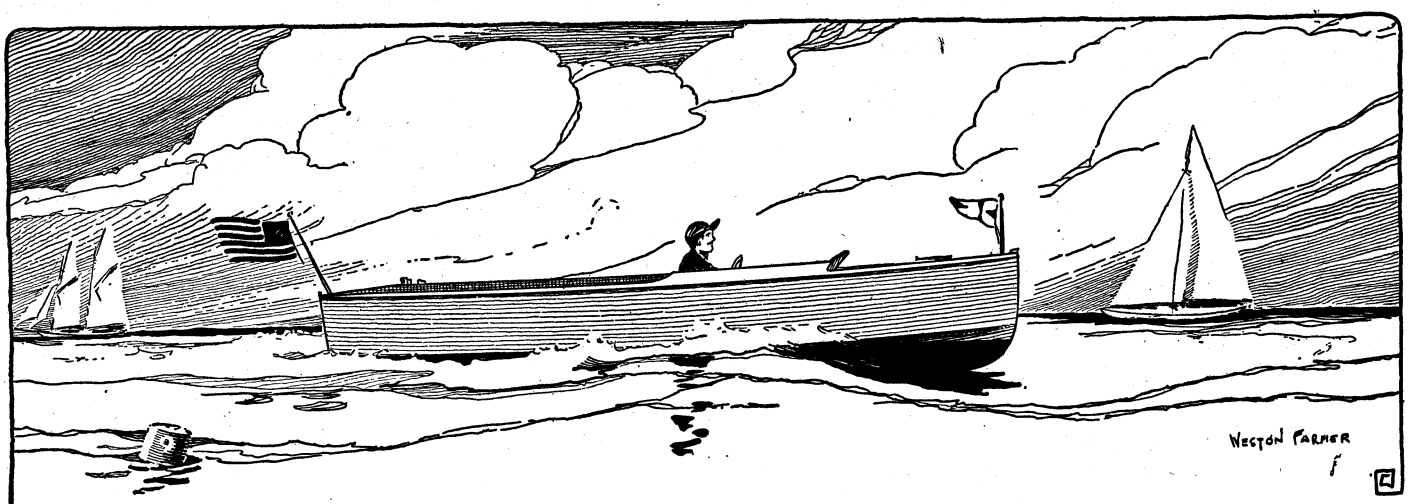
Fig. 11 shows the standard method of fastening planks to V-bottom boats. There are variations, of course, according to local custom and shop, but the method shown is usual.

The novice will build his boat with planking too wide. This is not good. Strakes of *narrow* width will last longer and stay tighter. *Four or five inches at the widest, perhaps six, and two or three at the narrowest* is the usual professional rule.

In round-bilged boats there is great latitude in fastening. Some of the more usual methods are shown in Fig. 12. These sectional views are self explanatory. Further detailed description is carried in any of the encylopedic boat manuals, and the beginner should arm himself with at least one copy.

How is a hull kept tight? Either by caulking with seam gunk as in the case of the lightly-built plywood type of boat, or by a compressed seam which is often used in seam-batten boats, or by good, old-fashioned cotton caulking rolled in with a wheel, as at Fig. 13. The inner edge of the seam is fitted tight, and an outgage of from 1/16" to ⅛" is provided to lightly roll in a thread of cotton, after which the seam is puttied and sanded. In larger hulls with thicker planking an outgage of from ⅛" to 3/16" is provided, on planking from 1" to 1¼" thickness, and cotton is caulked in lightly with a caulking iron, as shown in Fig. 14. All seams get the putty treatment.

Waterlines often stump the beginner. Fig. 15 illustrates the best way to get a straight, true waterline before launching. Batter boards are set up level, and chalk string used to snap a line which can then be graved in with a hook knife, called a race knife. This then, rounds out the basic steps usually unknown to the novice.



PIUTE — Complete Plans For a Sensible Deep Sea Runabout

Go where far shores call—go when you want to go regardless of rough water in this fine family boat

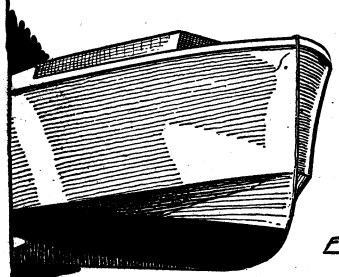


Fig. 1

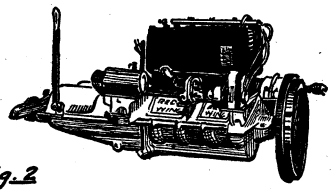


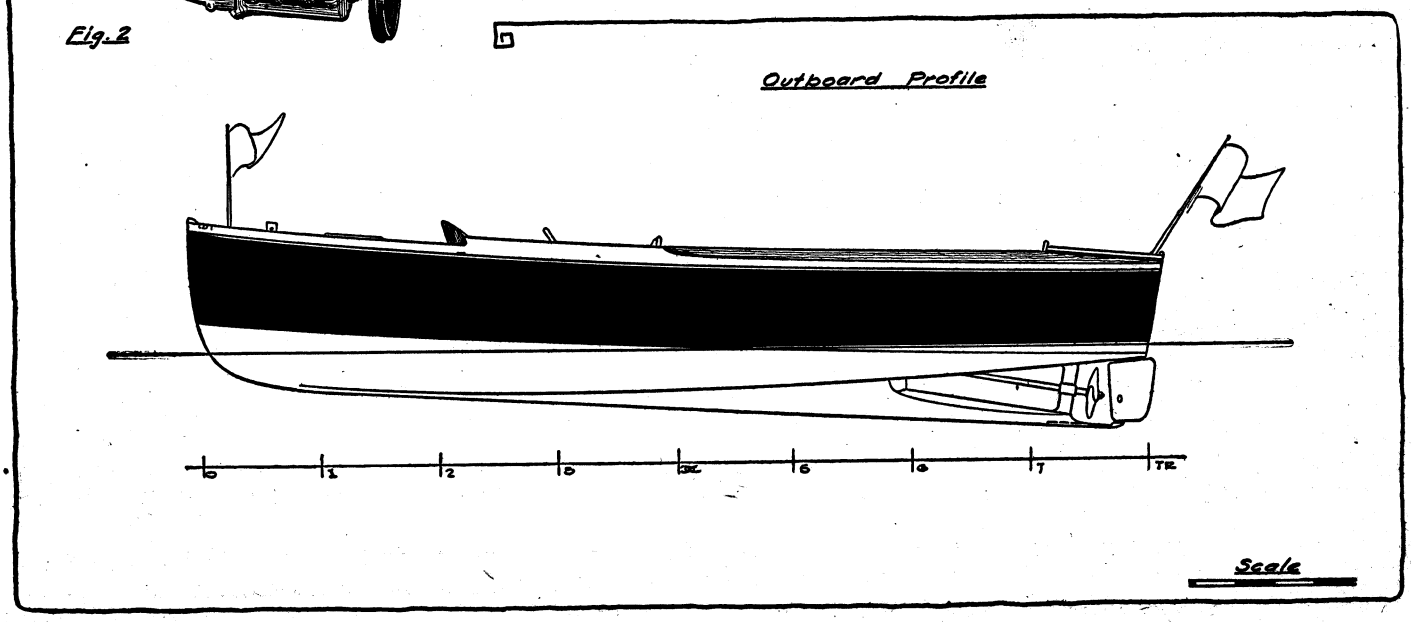
Fig. 2

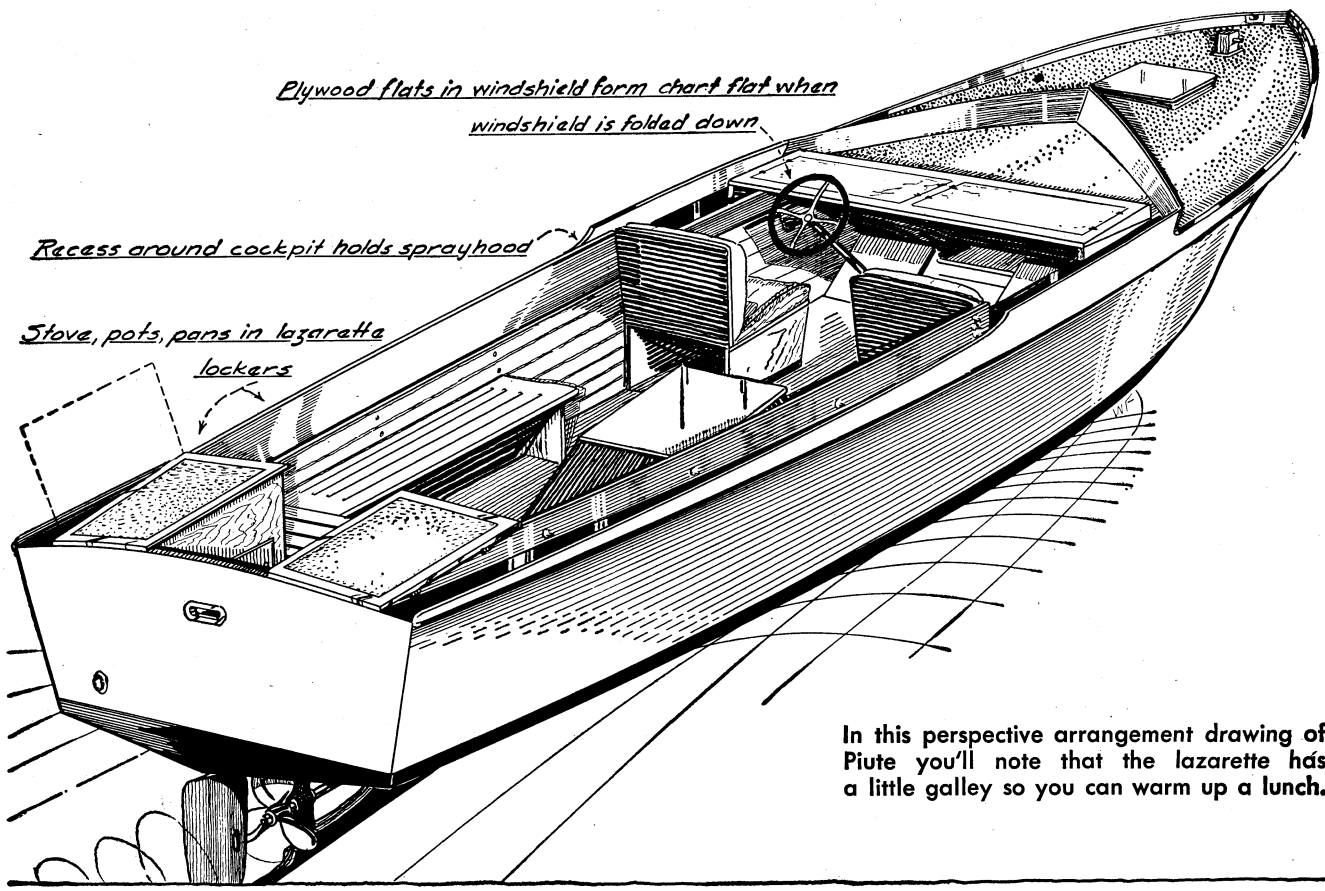
By WESTON FARMER

PIUTE was conceived miles offshore mid towering black seas such as seem to run only on October afternoons. The "modern" basket of slats I was ferrying across Lake Superior was typical of the fancy, or showroom school of design, and was making lousy weather of it.

Right then it dawned on me why you never see the runabout type of boat on big water: they can't take it. When you check them down to sensible going at a safe speed of 18 to 20 miles an hour, they get wet enough to drown you.

So I dipped back into experience for that once-prevalent type of boat which could slice through the going in easy fashion. The call for "showroom" speed has killed off production of the type. But you can't use any "showroom" speed except under ideal, or advertising conditions:





In this perspective arrangement drawing of Piute you'll note that the lazarette has a little galley so you can warm up a lunch.

Mediterranean blue skies, glassy surfaces on which everything appears like a shallop on a sea of dreams.

The weather still blows on big water. It always will. It rains, too. And weather won't wait. So since time is precious, why not have a *boat* that doesn't have to wait, either? *Piute* is my answer to this need. Powerboat men who know big water will cheer her advent.

The hull is of semi-planing type. She will lope along all day at 18 to 20 miles, will not be insufferably wet when checked down in the harder chances, and is premised on weight, length, brawn, and a slow turning prop—about 16-inch diameter at 1,000 rpm.

Now this is fortunate. You *can* use the modern and utterly reliable 40 to 50 horsepower runabout fours with a reduction gear and get the prop kick you need. Without a reduction gear on today's motors in this boat you won't have that Cadillac ride. Modern motors *without* reduction do not have prop diameter enough to give a real horse kick to the business end.

So, to get this kick on a *direct* drive, we can revert to type in motors, too, and use the kind shown in Fig. 2—an older type such as the Red Wing AA, or Kermath Vanadium 20. This kind of motor never seems to wear out in normal use.

Motor makers are always well-stocked with such engines they have taken in trade, reconditioned good as new, and can sell for $200 to $300. Gray model Z, Kermath, Palmer, Red Wing—all are available today. They will swing the wheel area wanted, and they have Percheron horses in their cylinders—not hysterical Shetland ponies.

Any motor of about 4-inch bore by 4-inch stroke delivering 20 to 25 hp at 1,000 to 1,200 rpm and weighing in the neighborhood of 650 pounds will be ideal.

I mention power at some length, with highlights, because you won't get the feel designed into *Piute* if you substitute a lightweight, high output direct drive mill. Large diameter props of low pitch, wound up at 3,000 or so, won't give you the lope and ease and range you need. So much for feel.

Now a word about arrangement, and then to building specifications.

On a lovely and nicely balanced hull of the semi-planing, or more nearly true displacement type, we have a high-steeved chine as shown on the lines plan and at Fig. 1. This gives an easy riding boat. The bow wave of this hull cleans off the chine right around Frame 3, according to the testing model I built and towed. The crew sits at about this point and so will ride dry.

Freeboard will give you shoulder-high protection behind the coaming, which is nice in blowy weather. In plan, as you can see from the perspective, the forward deck is encompassed by a rail or bulwark a couple of inches high. This deck drains rain and spray *outboard* through a scupper at the visor break.

Up forward is an access hatch for gear, and to stand in when securing ground tackle. All boats should have this. Ventilation, security, escape, stowage are all factors obtainable only with such a hatch.

Next on the deck comes the visor. This is primarily a spray and rain break. By raising the bulwark to visor height in way of the best riding position in the boat, we thus surround the covering board, making it a nest for the bows of a sprayhood, without which no open boat is really stormworthy.

That the visor is most practical is attested to by its continuing popularity, and by the fact that the Navy uses it freely today in all their stuff. Coast Guard, too. Hence the term "military type" which I use to explain why she is not the boat the modern streamline-dreamline-scream-

line school of paper sailors yell about.

It seems to me that the prettiest boat always results from being supremely functional. Let the hull shape result from the bulk needed—let the looks result from the way good honest lumber wants to stream when it is applied to that bulk, and you've got something beautiful in the sense that the boat's bulk is beautiful. The shape of the bulk alone can be beautiful—not lines or profiles or sections. They are two-dimensional, and are only outlines.

Into *Piute's* bulk abaft the steering position, we put the motor. It is placed on the center of buoyancy. So, any motor of any weight can't then unbalance the running characteristics I want you to have. Different weights will then mean only slightly different waterlines.

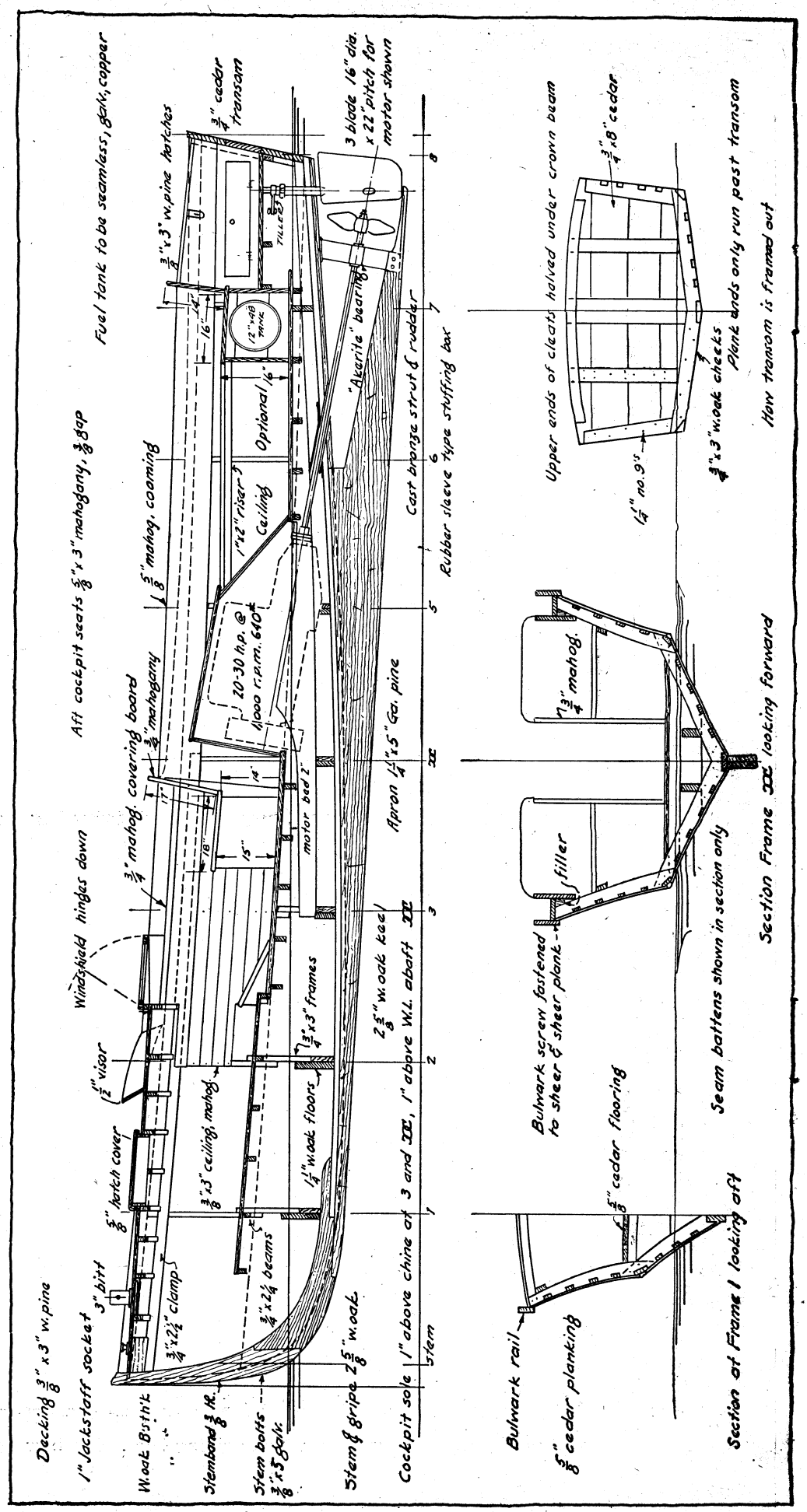
Access to the hull side, inboard, is necessary in "working ship." We provide this by putting the break in the seating arrangement just abaft the steering position. Not only does this provide side-of-hull access, but this break also supplies floor space for tools, oils and so on when the box is off the motor.

Next come two good side seats. These provide load trimming facilities when more than two use the boat. They can also accommodate sleeping bags. And with the spray hood up on starry nights. *Piute* becomes a fine cruising boat for that young couple who want to cruise beach fashion; folk who are ready for more boat than an outboard but who cannot yet afford a cruiser.

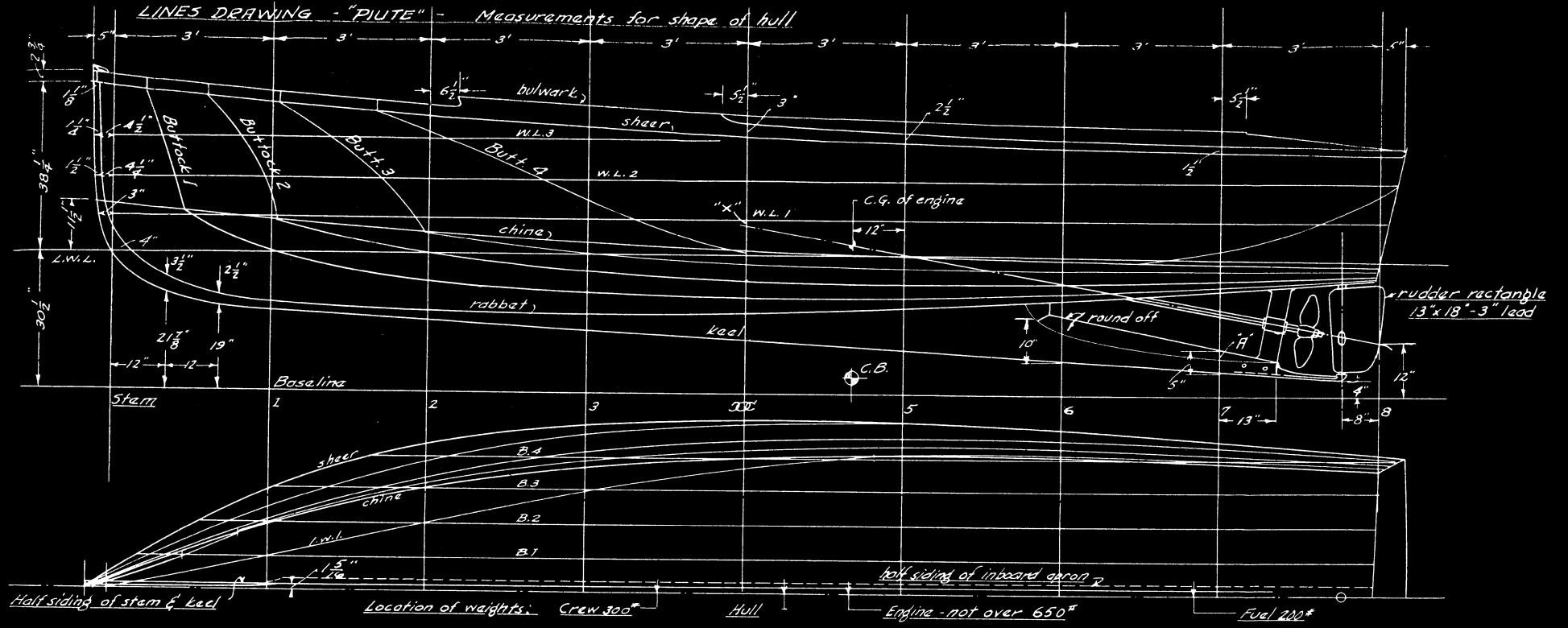
Instead of running the side seats to the transom, I've saved about three feet for a catch-all lazarette. This is in the form of full-depth hatched lockers, port and starboard, with a rope and gear floor between. Under the seat sits a seamless galvanized or copper fuel tank, holding about 30 gallons, or enough for 125 miles of going on 20 to 25 hp at 1,000 to 1,200 rpm. In one of the lazarette lockers one can stow a Primus stove, pots, pans, dishes. The other can be the ship's larder.

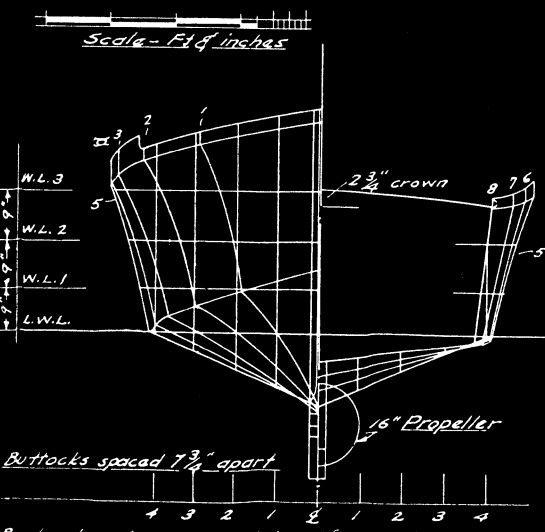
This gives you most practical accommodation. And engineering-wise, it gives you length which you need for easy going and it shortens the cockpit while putting weight forward, where it is needed.

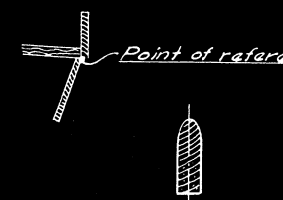
So much for arrangement, except to explain the windshield forward: this folds back flat when you don't



LINES DRAWING - "PIUTE" - Measurements for shape of hull



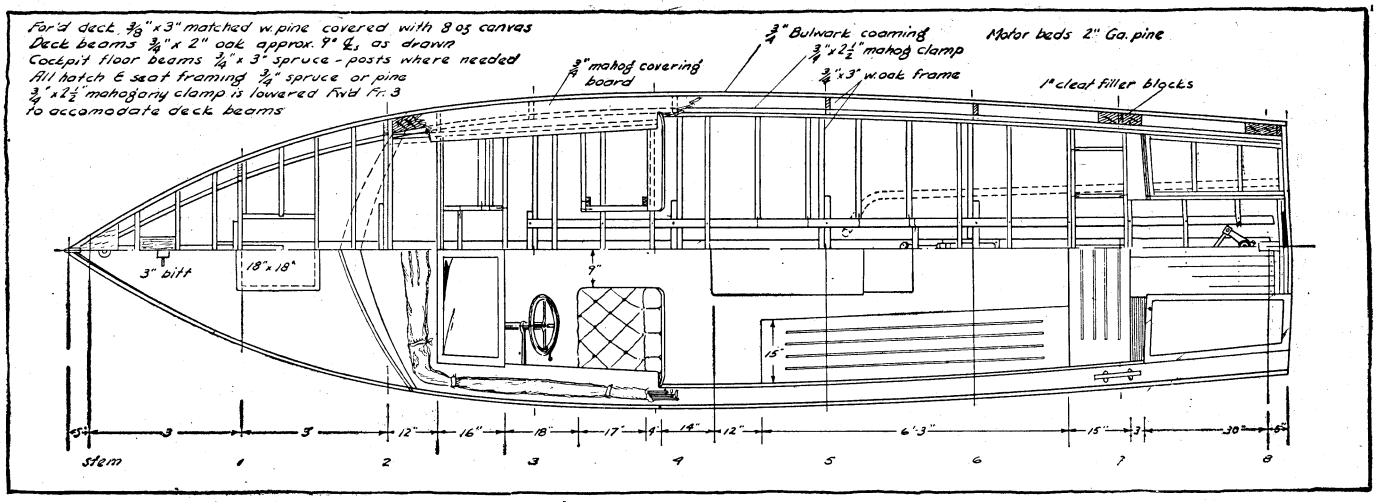




"X" Take this distance from motor actually used allowing pan clearance at frame 5. Make full sized plan and keep C.G. motor as shown.

Frame #	Heights above Baseline									Half breadths from ℄						
	Bul'w.	Sheer	But.t 1	But.t 2	But.t 3	But.t 4	China	Rab't	keel	Sheer	W.L 3	W.L 2	W.L 1	China	L.W.L	Rab't
Stem	5'7.4	5'2.6														0.1 5/16
1	5'7.4	5'4.5	2'7.4	3'8.0			3'2.3	1'8.2	1'6.0	1'10.6	1'6.6	1'4.3	1'2.7	1'2.5	0'7.6	"
2	5'4.5	5'2.0	2'0.6	2'6.4	2'11.4	4'10.4	2'11.6	1'6.3	1'4.1	2'9.2	2'5.4	2'1.7	2'0.2	1'11.2	1'3.4	"
3	5'5.4	4'11.4	1'10.0	2'3.0	2'7.1	3'7.2	2'9.4	1'5.5		3'2.0	3'0.0	2'8.0	2'5.4	2'4.1	1'10.6	"
XX	5'1.0	4'10.0	1'9.4	2'1.0	2'5.0		2'8.0	1'6.0		3'3.1	3'2.0	2'10.4	2'8.2	2'6.4	2'3.7	"
5	4'10.6	4'8.6	1'9.4	2'0.5	2'3.3		2'6.7	1'7.2		3'2.6		2'11.3	2'9.2	2'7.4		"
6	4'9.2	4'7.4	1'10.6	2'0.6	2'3.4		2'6.0	1'9.0		3'1.2		2'11.0	2'9.0	2'7.0		"
7	4'8.3	4'6.6	2'0.4	2'1.6	2'3.6	2'9.0	2'5.4	1'11.3	0'5.4	2'10.7				2'5.7		"
8	4'7.6	4'6.1					2'5.0	2'1.6		2'7.7				2'4.0		"

Table of offsets in Ft. Inches & 8ths to outside of 5/8" planking
Waterlines spaced 9" - Buttocks spaced 7 3/4" All frames to be diminished by planking thickness after fairing



The upper half of drawing above shows framing at deck and flooring level. Scantling sizes for all members are shown. Lower half of plan shows fore-and-aft placement of seats, visor, and fittings.

need it, and is protected by plywood flats rabbeted into the glass frames. When folded back flat this becomes a chart table and helps protect the cockpit.

Now for building the boat, and her specs: as with all boats, you *must lay her down full size.* This will require a floor to work on. I have seen boats of this length lofted in a room *half her length* (24 feet-10 inches O.A.) by lofting the fore half, then the aft half. It *can* be done if you're mechanic enough. And since this is hardly a beginner's boat, and since anyone who has done his first job of building will find *Piute* easy to build, I'll skip the step by step stuff and go to a general outline.

She is best built *bottom up.* To do this, run a line at a convenient height above the base line and above the sheer line so that, if the plan were turned over, this line would become the floor line. Loft out the boat to the outside of planking as the offset table shows, paying attention to the waterlines and getting the frames curved as shown. This is not hard to do.

Frames (topside) from one to six have shape to them. Bottom frames from one to four have shape, and frames five, six, seven and eight are straight, keel to chine. The boat will plank easier if the modeling shown is kept. Beware the advice of *friend, neighbor* or *Mr. Expert* who says straight sections all over are best. He has never, with his own hands, streamed planking on a hull. Lumber wants to shape when bent. Let's go with it!

The usual getting out of frames and keel follow, taking special pains to diminish the frames by the planking thickness, to expand the transom to its true face along the raked angle, and to get the transom bevels correct.

Here's a good dodge on the frames: The seam battens are not put in until after the frames have been erected on the floor, or on the sills, if you build that way. So it is easiest to get out the frames, diminished to planking thickness, *but* leaving an eighth of an inch or so of material still to be shaved. With the proper line for the inboard face of the planking marked on the frame, sink the battens to proper depth. This will leave the extra material between gains, or batten pockets, so that you can take a wood-block plane and face the whole frame down to batten level. The bevel will then come automatically.

Piute must be built where no rain will hit her. Better allow neither rain nor strong, direct sunlight. Such things make the lumber walk, and you can't preserve either measurements, or tightness.

After you've erected the frame, stream the battens in, spacing the pockets or gains on each frame equally. These battens are 3/4-inch x 1 7/8-inch (neat) spruce or yellow pine, in one length. If an occasional butt must be made, stagger the joints so they are in far ends of the boat. Use one 1½-inch No. 12 brass screw per batten per frame.

It will be better to have the local mill bandsaw your keel for you. They have the power and the tools. All you'll need is an accurate plywood or latticed template for them to work to. This keel should be of oak, and is sided 2 5/8-inch (neat, not commercial). This dimension can be readily effected on the mill's planer.

As shown on the scantling section, the keel is held to the apron and floor by a galvanized bolt ½-inch diameter, blind plugged on each frame. The apron will be 1¼-inch Georgia pine, which you can easily get one length, as this stuff grows to nice heights without knots. The floors are 1¼-inch white oak except in way of the motor, where they should be sided 1½-inch and molded to tie the frame heels together. The frames are of ¾-inch white oak, 3-inch molded and at the sheer ends are 2¼-inch molded.

There is no need for gussets or cheekpieces. The frames, if of oak and of this face width, are well held by three ⅜-inch galvanized bolts at the chine corner. The chines are of two pieces, inner and outer, of Georgia pine in single lengths. The inner, or flat piece, is ⅞-inch by 3-inch. The outer piece is 1½-inch by 1½-inch. Two screws per frame, of 2-inch No. 12 brass, will hold the inner chine to the frame. The outer member forms the chine corner, and should be planed off to a hard, sharp edge to make the water clean off quickly. It is a *mistake to round the chine.* Fasten the outer chine to the inner chine with 1½-inch No. 10 brass screws, deeply sunk and bunged, on 4-inch to 6-inch centers.

The clamp, covering board and bulwark scantlings are covered in

the construction, or scantling section. Note that the forward clamp is lowered. On this land the deck beams.

The planking should be white cedar, Maine white pine, or some equally light, tough, workable wood to finish 5/8-inch. Put on so as to space the strakes evenly at each frame, with battens under. The fastenings should be 1 1/8-inch No. 8 brass screws on 4-inch centers, bunged with pine bungs (obtainable at all marine hardware outlets upon advance order) set in varnish and lightly tapped into the bung hole. Special bits are available that will pre-drill to proper screw size and countersink for bungs in one operation. Bungs are trimmed off with a chisel later.

In connection with fastening, a portable electric drill is the clear caper, but there is no law against the "Armstrong" method, one at a time. Thousands of boats have been built by sheer elbow grease.

This covers the specs of the hull, and since it is hull we are primarily concerned with, and since the construction is the simple seam-batten type with which nearly every one who knows boats is familiar, not much need be said as to method.

Obviously, you have to arrive at the size and location of the parts. This you do by laying the job down. Obviously, too, these parts have to be fastened, and erected so they can be planked. As to fastenings, where I have not been specific, use a screw which, when sunk home, will come within an 1/8 or 1/4-inch of piercing the member. The *coarser* the thread, generally, the greater the holding power. Fine threaded screws are for hardwood.

When the hull is planked, of course, it must be planed, sanded, the seams payed with white lead primer and string caulked, and the seams puttied and glazed. Old stuff, and no need to repeat it here, except to caution about the caulking. Roll in each seam only a light string. Wood swells, and if the joints are between 1/32-inch and 1/16-inch apart inboard on the batten, the job will swell tight. Caulking is only a deterrent for launching leaks—leaks induced by hull working. *Don't pound caulking cotton into a seam.* Wood to wood fits are the tightest: if possible, work to tight wood inboard, leaving 1/16-inch outgage for the string caulk which is rolled in with a caulking wheel, and you'll have things ideal.

The rudder and strut deserve special mention. The rudder can be made of a bronze plate shaped as shown, but it would be a higher grade job to get out your own pattern and have the local foundry cast one up. Columbia Bronze, Freeport, L. I., has many rudder patterns, and they should be able to get you one of about the area shown. You *must* make a pattern for the strut. It need not be a split pattern. But it should be cast bronze, naval bronze.

The stern bearing is a Willis Akerite, obtainable from the E. J. Willis Co., 85 Chambers St., New York City. This is the smoothest of rubber bearings, I think, and the shaft never wears hex-shaped.

All details of inboard construction are straightforward carpentry, and will be obvious from the sectional views and from the arrangement plan. In this department, as to personal latitude, I say, "God bless ye." Done as shown, she'll be fine. But if you want something else, so long as weights of motor, crew and fuel are kept where they are on the lines plan, you'll get a good boat.

Don't, however, go loading up the interior with house lumber or use any scantlings above what are called for: i.e., 3/4-inch cockpit sole, 3/4-inch x 1 1/4-inch white oak seat risers, main cockpit floor beams 3/4-inch x 3-inch spruce, etc. Lumber in a boat gets wet, and wet lumber gets heavy. Heft kills performance.

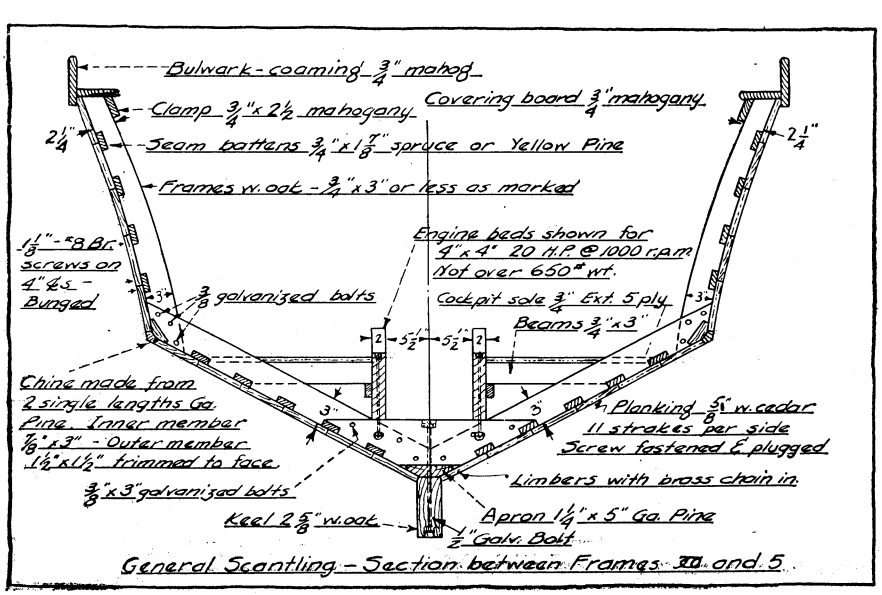
Now I can hear some letters winging my way asking the all-important question, "What speed will I get with my *Piute* if I put in the motor you say?"

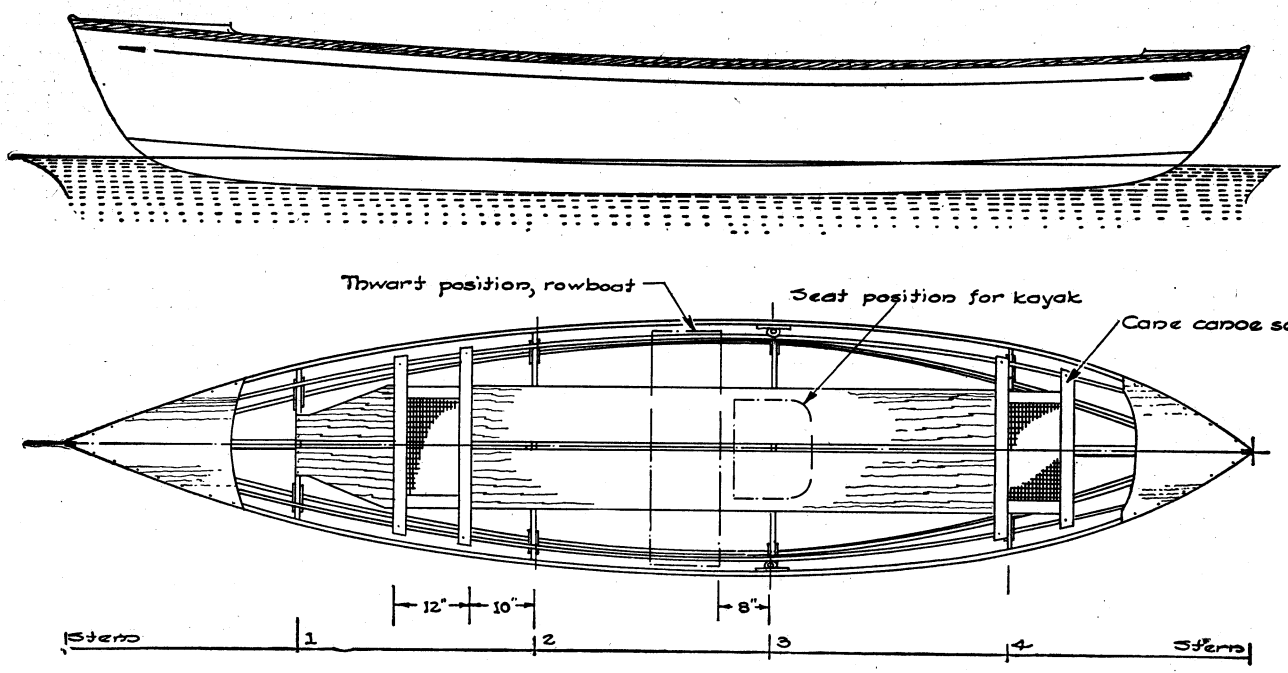
I hesitate on this. Speed of amateur-built boats depends upon two things: how closely the plans are followed, and the degree of hull finish achieved. If you follow the plans right out the window, and if you do a good sanding and a fine paint job, you should get 16 to 18 miles an hour.

A contract job out of a shipyard would go 18 to 20. William H. Hand, Jr., a famous designer of this type of boat, consistently got 20 to 21 miles an hour on hulls of similar weight and displacement. It was a matter of fairness and finish. But suppose you find a good mill of the Fig. 2 variety, around 4-inch x 4-inch on 650 pounds and turning 1,000 rpm, then a three-bladed wheel 16-inch diameter by 22-inch pitch will give you 16 real land miles per hour, on nominal slip. Since this is equal to the usual called speed of 20 mph, it is good going. Any boat that fast is really wiggling, and I should say honestly you can expect that speed.

So there you have *Piute,* so named after the old prairie Indian who could go all day on the lope without tiring himself or his mount.

Scantling section for Piute. The sizes of major structural elements of the hull are shown in correct relation to each other and the kinds of wood to use are stated. If woods are substituted, use wood equal in weight.





ROB ROY A COMBINATION CANOE-KAYAK

She's a combination boat with two sheer heights. You'll use her as a one- or two-man canoe, a one-man rowboat, or even as a large kayak

By WESTON FARMER

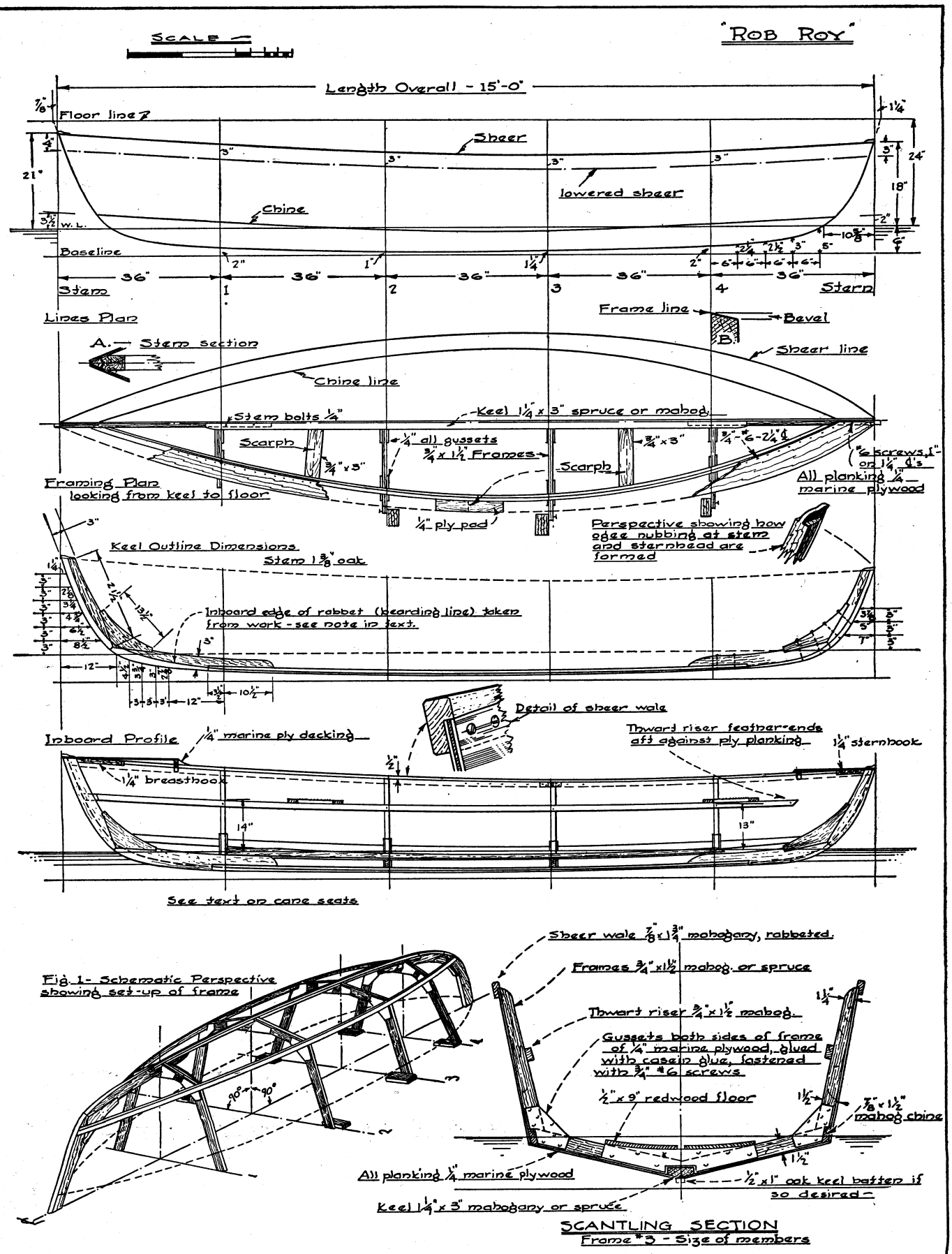
AN ARDENT canoeist and black fly devotee dropped into my Powder Island boat shop up on Nipigon Bay, Canada, last summer.

"I gotta have a boat that doesn't exist," sez he. "It's got to be as good as a canoe, but lighter. I may want to paddle her as a kayak, the better for shooting come fall. If I'm alone and toting a good camp load, rowing will cover more miles in a day than paddling. She'll have to be light because I may want to strap her to the pontoons of my Beaver and fly inland. I'll want her to be stiff, too."

He allowed as how he was going to hang around my boat and stoke at my galley stove until I designed him a special sort of craft for cartop and camp use. So it didn't take me long to galvanize the idea of *Rob Roy*.

She is named for the famed Scottish canoe of several generations ago in which Robert Louis Stevenson crossed Europe on its canals and lakes, and about which he wrote so charmingly in *The Adventures of Rob Roy*.

This *Rob Roy* in no way resembles Stevenson's boat, except that she is small, slim; and light. Our current *Rob Roy* fills my friend's variety of needs to a T, and is built of plywood, which Stevenson never heard of. Her main function will be as a canoe; she'll serve as a kayak; she'll row easier than a St. Lawrence skiff,



All of the dimensional and structural information to build Rob Roy is pretty well contained in the above drawing. The dimensions for stem and stern outlines are spread between lines and keel plan. Inboard profile ties in with scantling plan to locate all pieces.

though she is really none of these.

You will note from the arrangement plan that *Rob Roy* is a double-ender. And, if you want to use her as a canoe as most people will, she is fitted with cane canoe seats. Placed as shown, these seats will properly balance two persons for team paddling on long treks. Between paddlers you can accommodate a goodly load—up to 400 pounds of tent, gun, food and gear.

She'll be tender when light, of course—all light craft with dead rise are—but load her down, and she stiffens surprisingly and is much stiffer than a canoe. Yet she moves easily under paddle.

Her steeved-up bow will not dump seas inboard as a canoe's bow does. When camping alone, you sit on the bow thwart or seat, the narrow end of the craft is astern, and your load forward. Balanced thus, normal one-man canoe action prevails.

But I like my friend's idea of *rowing* when single-handing it. It's less tiring, faster going, safer. So I have shown permanent rowlocks.

Seven-foot silver spruce oars in loose, leathered oarlocks (the only safe oarlock) will complement your equipment. Kayak cranks will not fare badly on a seat placed as shown, using a double-bladed paddle and facing forward. Fine for marsh crawling, casting and camera work.

Commence construction of *Rob Roy* by laying down her lines full-sized, complete—profile, half breadths, body plan and all. Use a painted floor large enough to accommodate the boat, which is 15 feet over-all by 40 inch beam. Or stretch out a piece of brown building paper on the floor, tape it to the floor, and lay out on the paper.

You will need a chalk line to snap the waterline, centerline and baseline, and a wooden straightedge about 10 or 12 feet long, to permanently pencil in the snapped chalklines, after which the chalk may be swept off. Nothing excels a well-snapped chalkline for accuracy. Use a 1" square batten about 18 feet long for the sweeps of sheer, chine and keel.

Erect the perpendiculars at the frame stations, and you may then post off the outline dimensions from the lines plan, or, as may also be needed for the layout, from the keel outline dimensions drawing I have supplied.

This full-sized fairing is necessary with any boat. Do not attempt to build *Rob Roy*, or any other boat, from a mere cross-sectional full-sized body plan. My offsets, and the offsets of any other naval architect, are subject to errors in scaling, and it is up to each builder to correlate the plan view with the profile, and the whole with the body plan.

Once your full-sized layout is done, you are ready to get out the frames. There are four of them. They are labeled 1, 2, 3, 4 on the lines drawing. All the topside frames are straight, chine to sheer, or I should say at this stage of the game, from chine line to floor line. This is unusual. But the topsides of *Rob Roy* are in the plane of a truncated, warped cylinder about which plywood will lay flat in section. That makes her easier to build.

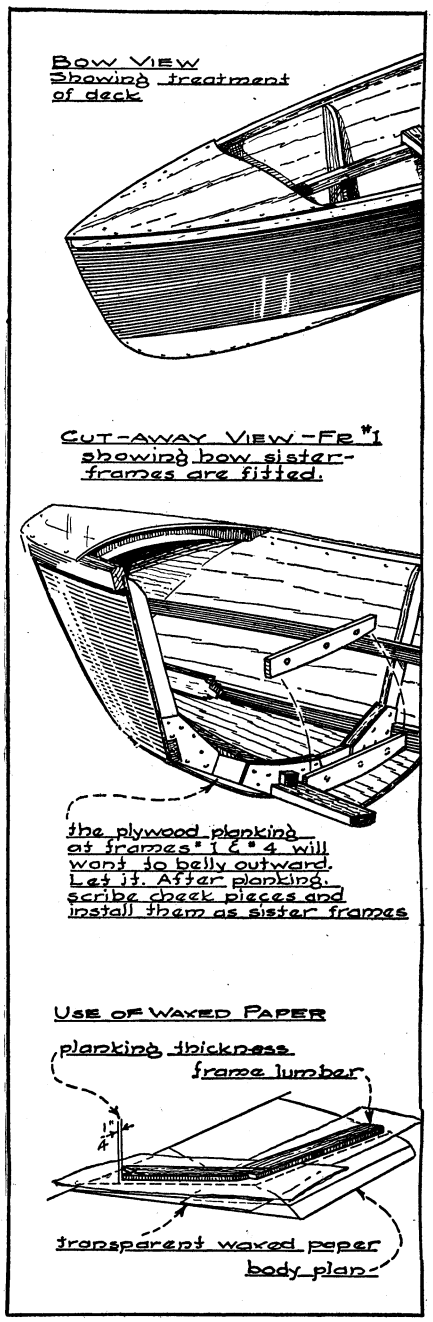
The bottom frames—2 and 3—from chine to keel also are straight section, and the plywood will lay flat on the bottom on those frames. On frames 1 and 4, as the bottom plywood is rolled home to the stem profile and fastened to keel and chine, it will bow out. Let it. Never mind how much. A sister frame is scribed later to lay alongside these frames on the bottom, and the fastenings then are put through. This is a practical way of working the thing: avoids tedious explanations, impossible lofting problems for the amateur, and like Tin Lizzie, works in spite of the dope.

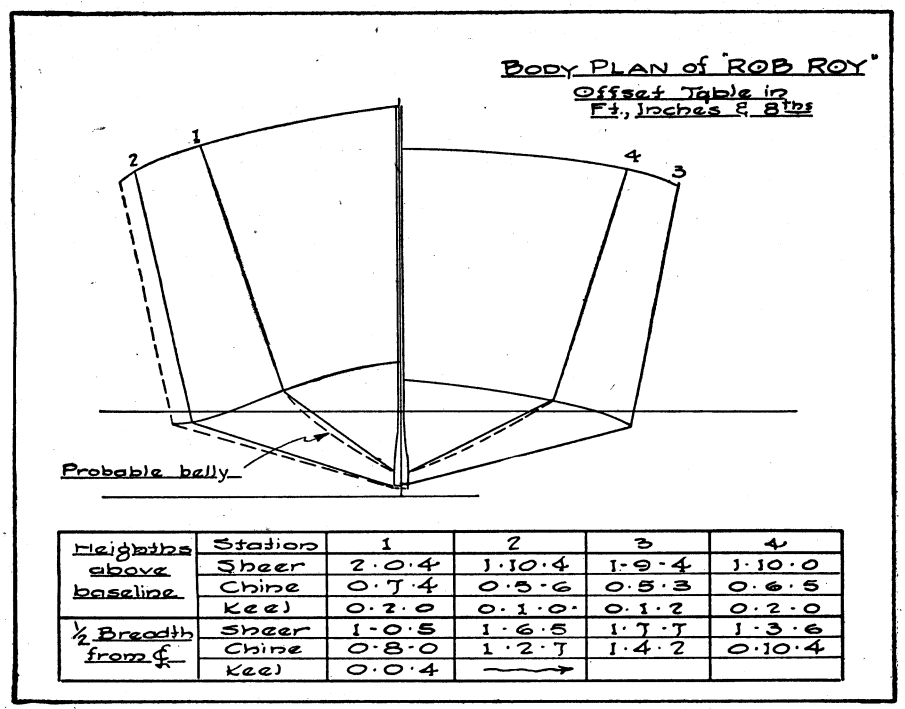
The topside frames are tapered to 1¼" width at the sheer wale. They are 1½" wide at the heel. All frames are of spruce or mahogany—both hold fastenings about as well, both are easier to work and lighter than oak. The cheek pieces, you'll notice from the scantling section of frame 3, are of ¼" marine plywood, glued and screwed to both sides of the frame. Use casein glue on these gussets, and ¾" No. 6 flathead brass screws. Note that on the planking side the gussets stand away from the planking about 3/16". This allows bevelling of only the toolable wood in the frame member itself.

The spaces between all gussets, where they run away from the frame, are to be filled with the same stock as the frame. This is true of the curved cross floors of plywood (gussets) which join the keel ends of the frame together.

An easy method of assembling the frame is as follows: After the body plan has been laid out and accu-

Plywood fore and aft deck bibs are installed as shown below. Also shown is method of allowing for outward bow of plywood away from end frames: use sister frames scribed to contour.





Heights above baseline	Station	1	2	3	4
	Sheer	2·0·4	1·10·4	1·9·4	1·10·0
	Chine	0·7·4	0·5·6	0·5·3	0·6·5
	Keel	0·2·0	0·1·0	0·1·2	0·2·0
½ Breadth from ℄	Sheer	1·0·5	1·6·5	1·7·7	1·3·6
	Chine	0·8·0	1·2·7	1·4·2	0·10·4
	Keel	0·0·4	——→		

This is the body plan you must make from the faired up lines drawing. The offset table gives the measurements in feet, inches and eighths from centerline and from baseline. See text for treatment of belly.

rately cross checked for heights and half breadths, scribe a heavy dotted line ¼" inboard from the frameline. This represents the face of the frame, because the lines are drawn to the outside of the ¼" planking. Now, place a piece of waxed kitchen paper over the body plan. This will permit the dotted frameline to show through. You can lay your frame members in the proper location over this waxed paper, and, mixing the casein glue with which the gussets and fillers are secured, proceed to tap these members together secured by brads. In 24 hours the upper set of gussets will be sufficiently set to enable you to screw fastenings in, these being ¾" No. 6 flathead brass screws. Then immediately glue and screw the opposite side.

You will note on the inboard profile that the frames in the forward end of the boat are *forward* of the frameline, and those aft of the midship section are *aft* of the frameline. The detail B in the half-breadth plans shows why—the frame is built to the frameline, and the bevel is taken *off* one side, leaving the other neat to the frameline.

You will also note from the scantling section that the gussets which form the floors over the keel are cupped. There is no objection to running them straight, except that a lower center of gravity for the load stowed results, also it is very conducive to handling and boarding steadiness to have cupped floor boards thus. Tends to center a live load.

The stem and stern timbers are next fashioned. These are of 1⅜" white oak, molded as per the keel dimension plan. They can be assembled in the same fashion as you assembled the frames. Bolts, preferably brass, ¼" diameter, are countersunk and plugged in the outboard face, and bolted over washers. Then the bevel between sheer and chine can be cut in, using the angle picked up from the half-breadth flow of lines to the stem. If you are a rattling good mechanic, you can guess the flow of bevel from chine around the forefoot to the keel. But since this bevel is a simple thing (the plank runs over the stem as per detail A—stem section) and is not rabbeted, it probably will be easier to plane the bevel in *after* you see how the bottom planking rolls on. More later about all this.

The keel is the next member you fabricate. It is a simple stick of clear 1¼"x3" mahogany or spruce. Either will do. This is not bevelled until set up in the frames.

Now you put a grid down on the shop floor as shown in Fig. 1, which shows the schematic perspective of the frame setup. The frame ends are tacked toe-wise along the frameline, and blocks are then nailed down to properly hold the frame head in position.

Rob Roy builds more easily then a pram, really, and cross-spalls, across the head of the frames, will not be needed until after the boat is all planked and you are ready to turn her over. Put them in then—*don't overlook this.* Your boat will change shape if cross-spalls are not provided until the riser and thwarts have eventually been installed.

All frames must be 90° to the floor, and at right angles to the frameline.

Next bend in the chine. Since the frames have been gained or notched out for the chine member, the chine will go in flat and unbevelled. It is easier to bevel it on the framing setup than on the bench, because the proper bevels will at once become evident. You may have to add an extra backing piece forward of frame 1 and aft of frame 4 to accommodate fastenings on the steep bevel. This is okay. Another way to fay the plank down to the chine, if it thins out and won't hold screws, is to use copper clout nails as rivets, over small burrs, on about 1¼" centers. Most mechanics will prefer an added backing piece glued to the chine

If I were designing this little boat for ordinary boat shop construction, I would specify a heavier clubbed end out of 1¼"x3" stock at bow and stern, which would mean to a professional boatbuilder that he should run his chine stock through the planer at 1¼"x3", and crank down the planer feed to ¾" after frame 1 was passed, and open it again to 1¼" from ¾" after frame 4 was passed. (Hint!)

One good screw, about 1½" No. 10 flathead brass, goes through the chine into each frame landing. One-inch ditto will do at the stem and stern, two per chine.

At this stage of the game, your frame looks exactly like Fig. 1. Mark the frames for the sheer height, and get out a pattern for the topside planking. This boat has been planned to work out of standard 4' x8' panels. Long enough sheets of plywood are available from the plywood makers, but seldom are available in builder supply stocks. Hence, on 8' panels there will be some waste. That's unavoidable, because

this boat is designed for wind, wave and weather. It has the required bulk for the work in hand, and is not drawn to get every last grunt out of plywood panels.

So on the framing plan, about amidship, topsides, you will see a scarf indicated. A ¼" plywood pad about a foot long is glued and either bolted or riveted to the two strips of panel which form the topside. These pads are not shown in the inboard profile, because their location is your choice.

You may figure out some neat way of getting more from your plywood than I can. The main idea is to *stagger* the topside joints and bottom joint, because the bottom, too, on 8′ panels will have to be scarfed.

And here comes my previously promised word about the roll, or bow, in the bottom planking. The framing plan shows two scarf members on the bottom, of approximately ¾" end thickness, by 3" width, bellied out in the middle to the proper roll or bow which the fore and aft bib panels require. After the topside is planked, using ¾" No. 6 flathead brass screws on 2¼" centers, with the chine seam bedded in some sealing compound like Sealer 900 or Kuhl's Elastic Seam Composition, bevel the chine and topside.

Then tack on the middle panel of the bottom, using only a few screws at first to hold it in place. This would be the panels between the proposed scraf points. Bib ends are cut out. The stern bib will likely bend dry, but the forward bib should be persuaded by boiling in a washtub for about 15 minutes. In any event, it is merely a matter of using your noodle and ordinary mechanical horse sense to get the scarf battens of ¾"x3" cut to the proper amount of belly. Don't, for the love of Mike, try to screw the plywood down flat at this point, because the rest of the planking will then festoon like pillows between frames. Invest the moderate sweat it takes: it will pay off.

With the bottom on, using ¾" No. 6 flathead brass screws on 2½" centers along the keel and 1" on 1¼" centers on the stem and stern posts, the edges of the bottom panel are planed flush. You may want to add a spray knocker out of ½"x1" oak here, but I think its fastenings would weaken the already well-threaded chine. Perhaps fiberglas might pro-

vide a scuff-proof, watertight chine. It's your option, and easy to do.

Fiberglas is a spun glass cloth, very tough, which can be laid over a plywood or other wood surface after a plastic gunk has been brushed on. I'm no chemist, and don't know what this gunk consists of. But I am told it is a resin. Into this resin the fiberglas cloth sinks and becomes invisible. Over this you brush another coat of gunk, and the whole dries hard as glass, but quite resilient. Consequently the process has good bonding qualities.

For a *Rob Roy* intended for banging around in the rocky northern lakes, provided you could afford the extra portage grunts, fiberglasing the bottom would insure launchable-at-will tightness, and some strength. Costs vary considerably, colors may be added to the gunk; the whole development is sworn to by those who have used it. These are statements made to elucidate, not recommend, because this option is again yours. Painted or varnished only, *Rob Roy* will be very serviceable.

With the cross-spalls placed at the frame heads, pull up the floor nails and roll her over. The next things are the sister frames on the bottom at frame 1 and frame 4. These may be needed and may not be. Plywood rolls differently in each individual panel. But if the bottom bows away from the straight frame on which you lofted the boat, install a scribed cheek piece to the frame, cut and bevelled to accommodate the bow. Screw fasten this to the frame first, and then run in a few ¾" No. 6 screws from outboard—just a few. Don't pepper this part with fastenings, two or three will be ample. Moderation is best here, as in yodeling.

At this stage of the game, and with the cross-spalls left in (these are braces across the frame heads to hold the boat's shape) you can now fit the thwart riser and the sheer wale.

The sheer wale should come first, as it will not disturb the cross-spalls. This, as the sketch shows, is a piece of ⅞"x1¾" mahogany. I have specified mahogany because you can usually get it in one length any place that handles this wood. But birch, white oak, ash, or anything of that nature will be good. It must be in *one length* to give a fair hull. This wale is rabbeted on a circular saw up to within ½" of the top edge so that the plywood will nest in the rabbet. Screw fasten with very light screws on about 4" to 6" centers.

The thwart risers can next be installed. These are of ¾"x1½" mahogany, specified because of available length. There is no use trying to run the aft ends to hull shape and land on the stern post. The ends will want to bend up. So feather them to proper bevel so they lay against the hull planking and rivet the ends to the skin. Heights for this riser are critical, and are given in the inboard profile as distances above waterline.

Since *Rob Roy* is high-sided when light, but at correct paddling height with a normal camping load, I have specified that sheer height and thwart relationship which will give most comfortable two-man paddling under such conditions, using the standard chin-height paddle all experienced voyagers prefer. Long paddle, thwart at proper height to hold up your tail if you prefer to kneel—that's paddling perfection.

But should you plan to use the boat light as a one-man canoe, I would build it with the lowered sheer depicted in the lines plan. For a one-man canoe, the thwarts are placed exactly as shown, but you paddle from the bow thwart, the direction of the boat's travel being reversed. For such a craft, I believe the lowered sheer is best. Also for kayak purists who see nothing in *Rob Roy* but kayaking fun, I'd again prefer the lowered sheer. But as a load-carrying voyager, for either two-man paddling or one-man rowing, I'll take the higher sheer.

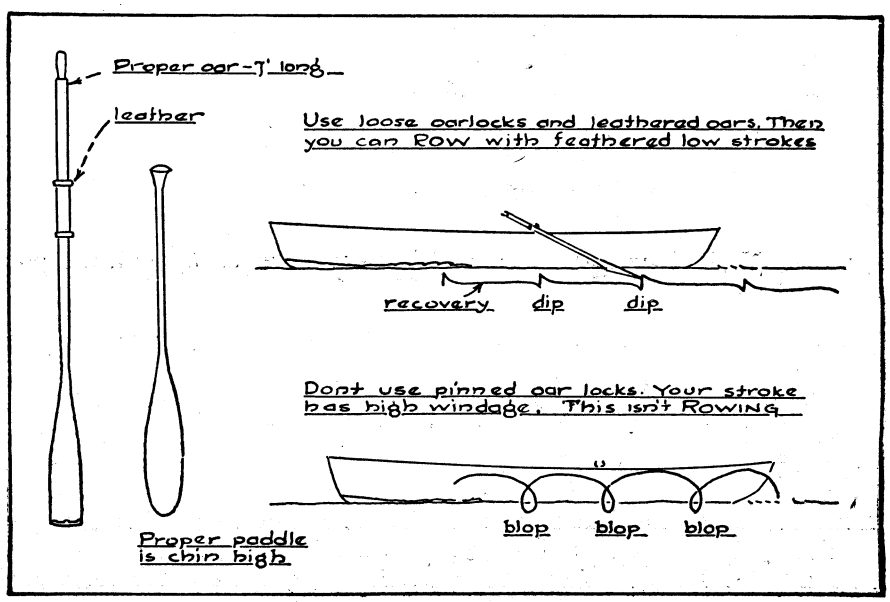
The lowered sheer, should you prefer it, is arrived at by lofting the boat to the lines and offsets shown for the normal sheer, then planking the topsides to the lower elevation. Simple?

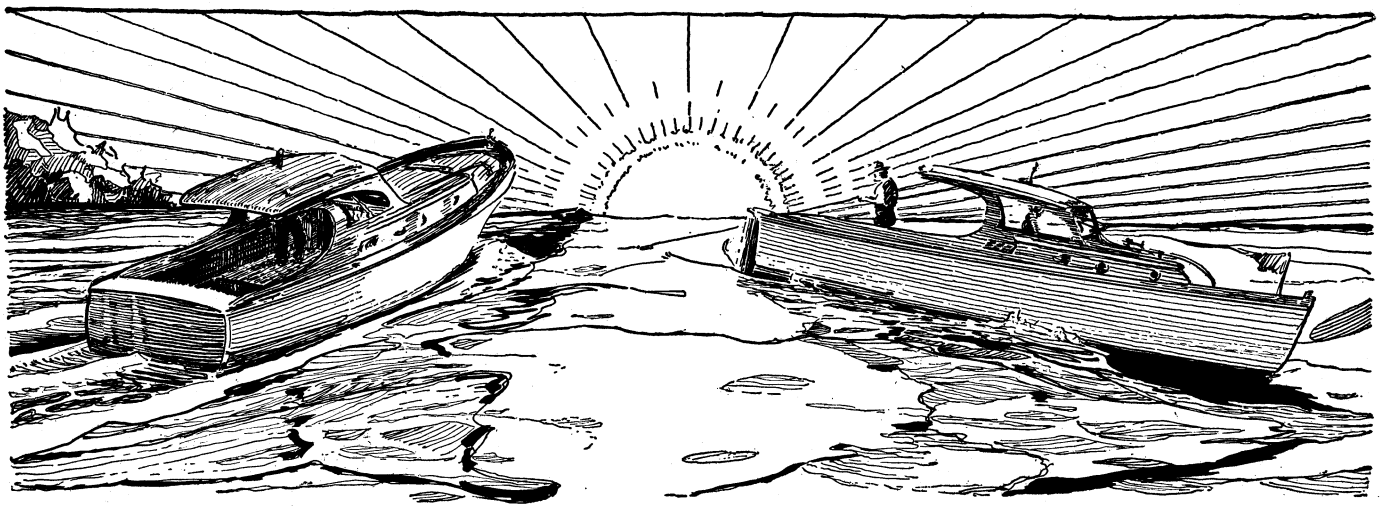
A word on the thwarts: I believe the Old Town Canoe Company, Old Town, Maine, still supply cane seats for those who wish to buy them, though I have not checked this point. If you live in Canada, you might try the Chestnut Canoe Company, Fredericton, N.B., Canada. It seems to me they'd oblige the home builder. But any local upholsterer should be glad to make these frames for you and cane them. They are light, strong, and have mortised frames. These frames, bolted to the risers, will now let you remove the cross-spalls and install the redwood floor boards. Then you coat the boat with Firzite, which kills Douglas Fir grain in the plywood so you can paint and sand it. Either paint or varnish will go over Firzite.

The oarlocks are installed, the little ¾"x2" oak carlins for the fore and aft decks are secured from the sheer wale inwards with long screws; the fore and aft decks put on.

Then, just as you did when you first got down on your knees to loft her, you launch and get into her just as you have built her—like a porcupine makes love: *carefully*.

If you use Rob Roy as a double ended rowboat, get spruce oars seven feet long and put the leathers on about as shown. Don't use pinned oarlocks as they are both dangerous and hard to row with. See sketch.





SUN DOG

She's handy and fast, safe in big water, economical to own

By WESTON FARMER

SUN DOG is a fast-gaited, small cruiser of optimum size for three- or four-day cruises where you must cover a lot of water. With any of the standard marine power plants like the Gray, Universal, Chris-Craft or Chrysler in the 95 to 105 hp range, she will cruise easily at 14 miles all day, and will top 16 in a pinch.

With a Chrysler "Crown," she'll cruise 16 and will do 17 to 19 miles light.

The feature of *minimum* sleeping shelter and *maximum* lavatory, galley and cockpit accommodations has evolved from usage in deep-water fishing, such as is encountered off Miami, the coast of Peru, at Alcapulco and Hawaii—all places where boats of almost the same dimensions, built by the famous old Elco Works, Bayonne, N. J., have proven their sterling worth. And thereby hangs the story of *Sun Dog's* genesis.

If memory serves me rightly, about 45 cruisers of this type in several series were produced and sold by Elco some 12 to 14 years ago. The original hull was drawn by Bill Fleming, whose wonderful eye for beauty in hulls is second to none. Now, the sea never changes, and when you have a good hull, it always stays good. It was my good fortune to have done designing for this fine old firm, now gone out of the yacht game due to inflation, taxes, labor costs.

Though the type represented by *Sun Dog* had been superseded by a boat I designed for Elco, the superseding raised-decker of torpedo boat persuasion was based on Bill Fleming's boat, and I got to know his *Elcoette* like a foster father. I always considered her the happiest strike in boat feel I ever knew.

So when Editor Kesting of SPORTS AFIELD asked me to give him the best cruiser design I could, I came up with *Sun Dog. Sun Dog* is a few inches smaller, but laid out the same. The hull is mine, as needs be, but the feel will be Fleming-Farmer, and the boat will be always, always good. Now to physical descriptions:

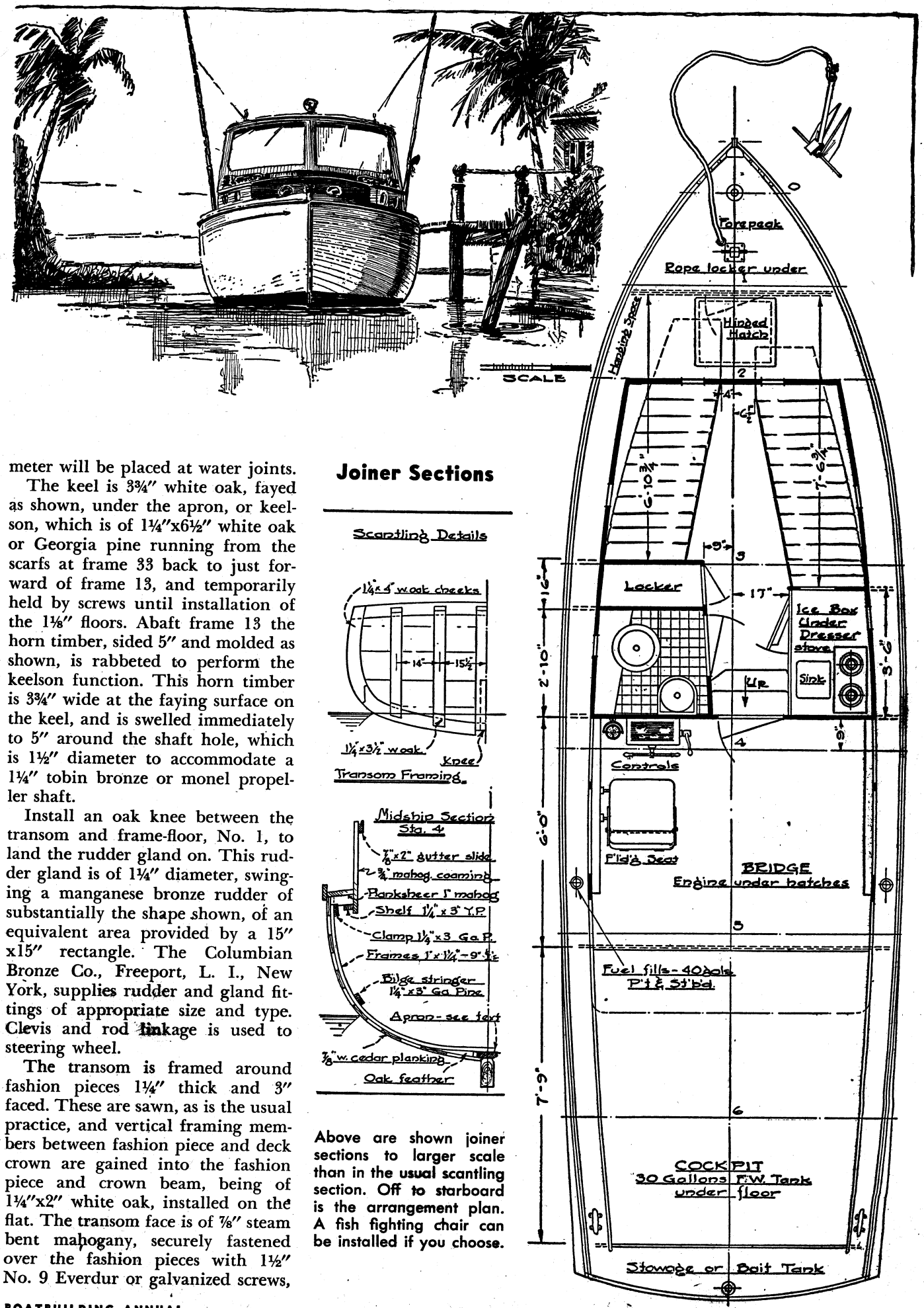
Sun Dog is 30′ 6″ long, by 9′ beam, and draws 2′ 2″ light with a Chrysler "Ace" 1.95 to 1 reduction gear motor. Rather than install the motor in a protruding box, which is always in the way, a bridge deck covers the motor flush. By using heavy engine floors or bearers, 4″ thick and molded to the hull form, and using side stringers, you keep the shaft angle low enough to accommodate a motor of this size neatly under the low bridge deck.

There is sufficient room, in fact, to install twin screws of as large as Chrysler "Crown" capacity under the bridge, which will give speeds of 22 or 23 mph, setting the hull down about 4″ aft and 2″ more forward than shown. The freeboard aft at the fishing position is 31″ to 33″ depending upon load, a very critical dimension for comfort. High-sided boats are murder to work big fish from.

Headroom under the wheelhouse canopy is 6 ft., also the same in the cabin. This has proved ample. The displacement of the boat will be about 9,300 pounds, give or take a few hundred either way.

Starting from the stem head on the inboard profile, here are the specs:

Stem is of 3¾″ white oak, molded as shown. This is secured to the knee by ½″ galvanized bolts, or drifts clinched over rings, leaded and bunged. The cark is also heavy, 3¾″, to give back-rabbet at the turn of the forefoot. It is secured to the knee by ½″ galvanized fastenings as shown. Pine stopwaters of ¾″ dia-



meter will be placed at water joints.

The keel is 3¾" white oak, fayed as shown, under the apron, or keelson, which is of 1¼"x6½" white oak or Georgia pine running from the scarfs at frame 33 back to just forward of frame 13, and temporarily held by screws until installation of the 1⅛" floors. Abaft frame 13 the horn timber, sided 5" and molded as shown, is rabbeted to perform the keelson function. This horn timber is 3¾" wide at the faying surface on the keel, and is swelled immediately to 5" around the shaft hole, which is 1½" diameter to accommodate a 1¼" tobin bronze or monel propeller shaft.

Install an oak knee between the transom and frame-floor, No. 1, to land the rudder gland on. This rudder gland is of 1¼" diameter, swinging a manganese bronze rudder of substantially the shape shown, of an equivalent area provided by a 15" x15" rectangle. The Columbian Bronze Co., Freeport, L. I., New York, supplies rudder and gland fittings of appropriate size and type. Clevis and rod linkage is used to steering wheel.

The transom is framed around fashion pieces 1¼" thick and 3" faced. These are sawn, as is the usual practice, and vertical framing members between fashion piece and deck crown are gained into the fashion piece and crown beam, being of 1¼"x2" white oak, installed on the flat. The transom face is of ⅞" steam bent mahogany, securely fastened over the fashion pieces with 1½" No. 9 Everdur or galvanized screws,

Joiner Sections

Above are shown joiner sections to larger scale than in the usual scantling section. Off to starboard is the arrangement plan. A fish fighting chair can be installed if you choose.

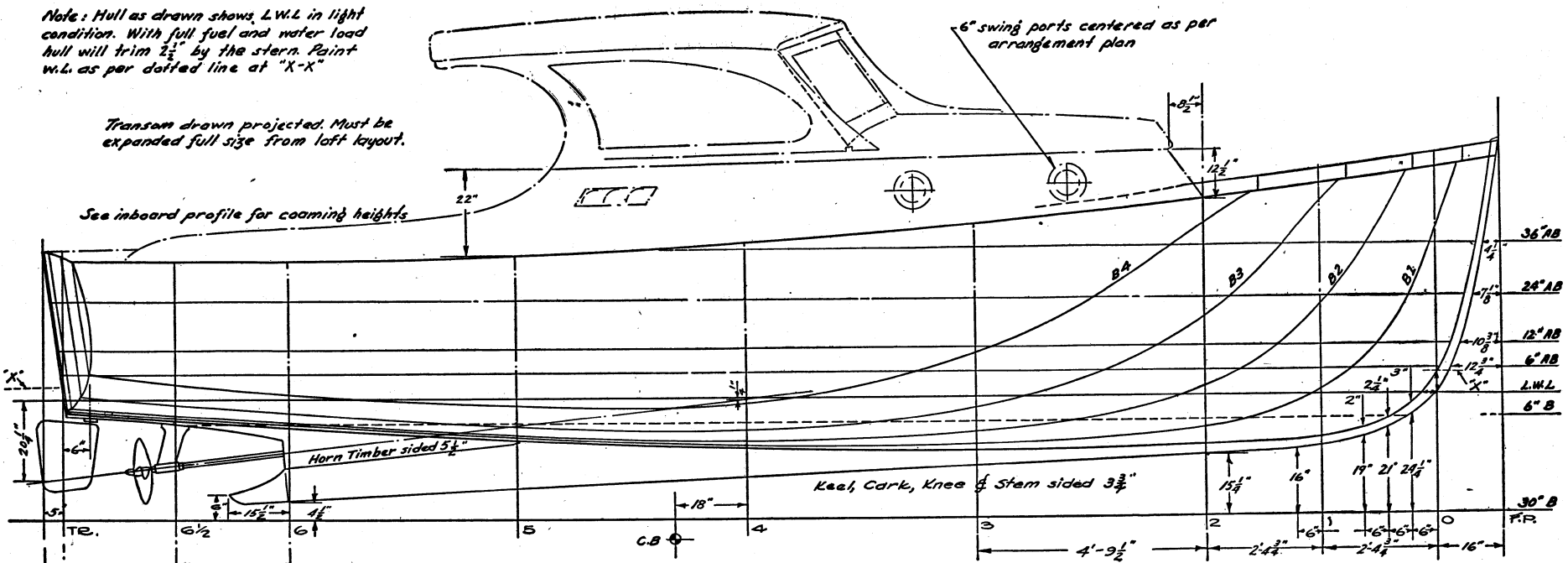
LINES DRAWING for "SUN DOG"

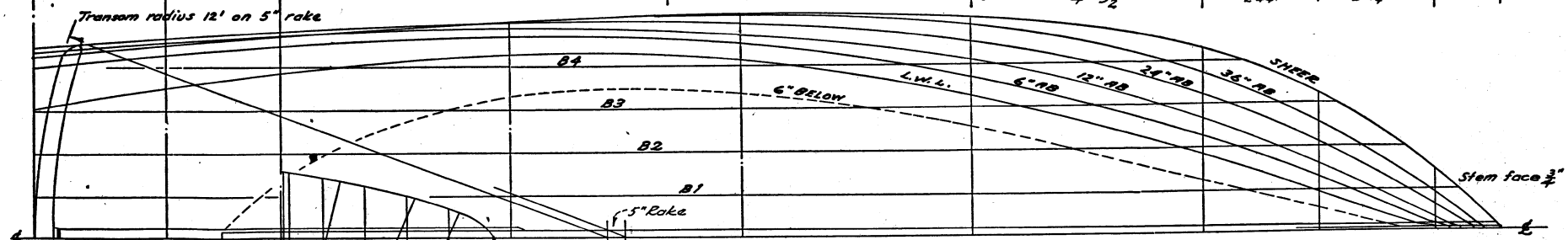
Note: Hull as drawn shows L.W.L in light condition. With full fuel and water load hull will trim 2½" by the stern. Paint w.l. as per dotted line at "X-X"

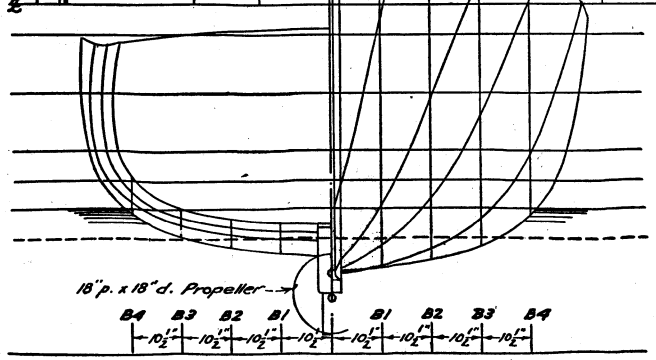
Transom drawn projected. Must be expanded full size from loft layout.

See inboard profile for coaming heights

6" swing ports centered as per arrangement plan



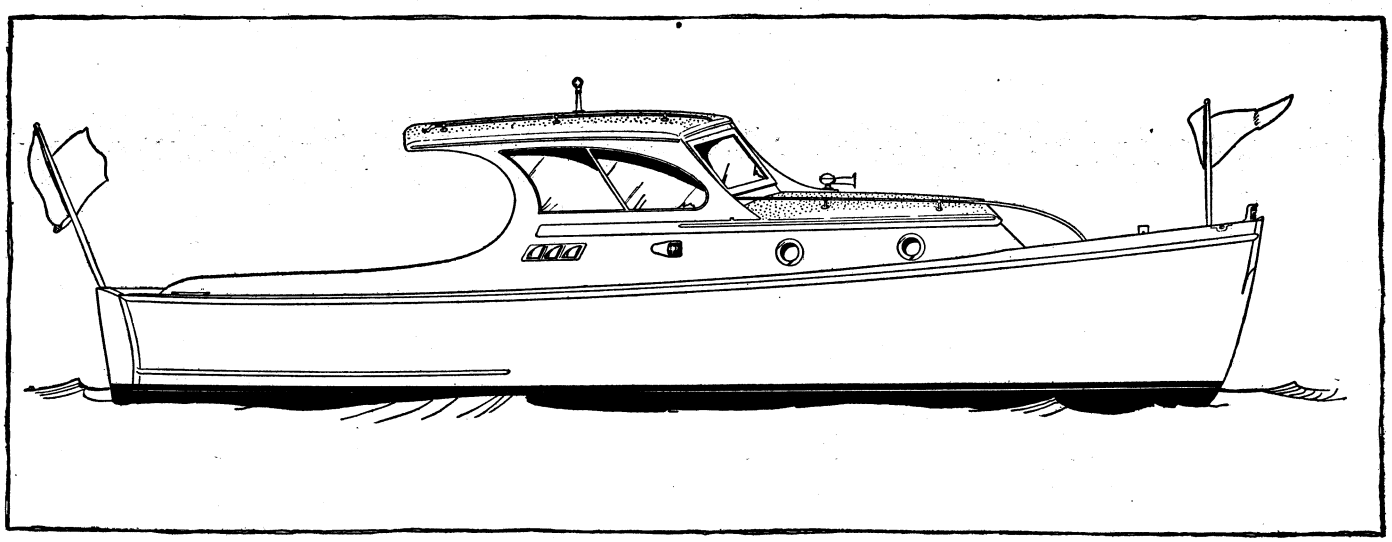




Dimensions in Offset Table given in feet, inches and 8ths

SECTION	Heights above Baseline							Half-breadths from Centerline							
	SHEER	BUTT. 4	B.3	B.2	B.1	RABBET	KEEL	SHEER	36" AB.	24" AB.	12" AB.	6" AB.	L.W.L	6" B	RABBET
Stem	7·3·5														0·1·7
0	7·1·5		6·5·1		5·10·4	2·10·5		1·3·0	0·9·3	0·6·2	0·3·4		0·0·3		
1	6·9·5		4·1·1	4·3·5	2·7·0	1·7·1		2·9·7	2·2·7	1·9·7	1·4·4	1·1·4	0·9·6	0·5·7	
2	6·6·3	6·0·5	4·1·1	2·7·7	1·10·1	1·5·5	1·3·2	3·9·1	4·3·5	2·9·7	2·4·0	1·11·7	1·7·2	1·0·7	
3	6·0·6	3·4·7	2·3·2	1·9·2	1·6·2	1·4·6	Rabbet	4·5·4	4·6·1	3·11·3	3·7·0	3·2·7	2·10·3	2·2·6	
4	5·8·2	2·4·4	1·10·0	1·7·2	1·5·7	1·5·3		4·6·6		4·4·3	4·1·5	3·11·4	3·7·3	2·11·1	
5	5·5·2	2·4·3	1·11·0	1·9·0	1·8·2	1·7·4		4·5·0		4·5·0	4·3·3	4·1·2	3·8·4	2·6·2	0·1·7
6	5·4·1	2·7·1	2·2·4	2·0·2	1·11·4	1·10·6	0·4·4	4·1·4		4·2·4	4·1·6	3·10·4	3·4·2	1·0·6	0·2·4
6½	5·4·0	2·9·3	2·4·1	2·2·0	2·1·2	2·0·5		3·11·1		4·1·0	3·11·7	3·8·5	3·0·5		0·2·4
TR	5·4·2	3·0·3	2·6·1	2·3·6	2·3·0	2·2·6		3·8·7		3·10·2	3·9·2	3·5·3	2·7·2		0·2·4

Half-breadths



The outboard profile of Sun Dog shows well integrated balance. The forward sash of the deckhouse swing out and up, and the aft window panel on each side slides forward to allow a breeze. Running lights and ventilators are also shown.

bunged with mahogany plugs.

The transom may also be double-planked: Use vertical ½" cedar strakes 4" wide between fashion pieces and crown beam, then rivet outer faces of ⅝" steam bent mahogany over this, with canvas in bedding compound between. The radius of the transom is 12' 0". The rake is 5". Of course, as any boatbuilder will know, the transom must be "expanded" to get proper framing size.

Next comes the framing. This boat is framed with 1"x1¼" white oak, known as green bending oak. About six to ten annular rings to the inch will be about right for coarseness, and the frames are to be laid, and sawn, with the grain flat. Spacing is 9" centers. There are a number of ways to land the heel ends of the frames: One is to land the heel about 1" away from the apron, right on the garboard, and side fasten to the floor. Another way which is *best*, but laborious, is to box each heel end into the apron in a mortised gain. The other way is to run the frame across the apron, and feather between the garboard and the frame with an oak feather. All are used—I suppose it will be up to you and your usual method to determine this.

The floors are of white oak, 1⅛" sided, molded to hull shape, depth as shown. These will fasten through the keel with ⅜" or ½" galvanized drifts, riveted over clinch rings on the floor top. In the way of the motor compartment all frames are doubled, feathered across the keel, staggered landings on the apron face as full length frames will be hard to steam evenly. The frames in the rest of the ship are to be riveted to the floors.

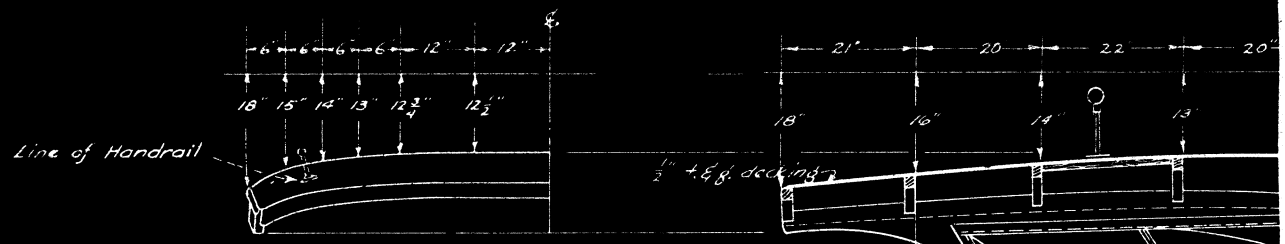
The bilge stringer, top outline of which is shown in the inboard construction profile, is installed *after* framing and planking, but *before* putting in the 4" heavy oak floor for motor bearers. This bilge stringer is 1¼"x3" fir, secured to each frame by two staggered 1¾" No. 12 galvanized or Everdur screws. The heavy motor bearers are worked up against the skin shape later, using carbon paper to blue out the high spots. These must be carefully fitted against skin and frame. They are drifted into the keel by two ½" drifts per floor. Normal fastening from plank and floor, of course. Against each heavy floor face 3/16"x3" steel angles are bolted to clamp the 1¾"x5" white oak engine stringers. Metal fishplates may be used in the stringer ends to avoid undue fastening loading.

This method of engine mounting has been used much and is resilient, secure. Also it's easy to put in and to change over to other engines without the un-building job sometimes required.

The clamp is of 1¼"x3" Georgia pine, which you can get in long lengths, and will be riveted to frame heads. It will be edge-scarfed in way of engine compartment double frames, approximately a 24" scarf between frames No. 15 and No. 18. Clamp to be installed below sheer edge sufficiently to allow cabin and coaming carlins to come to proper height.

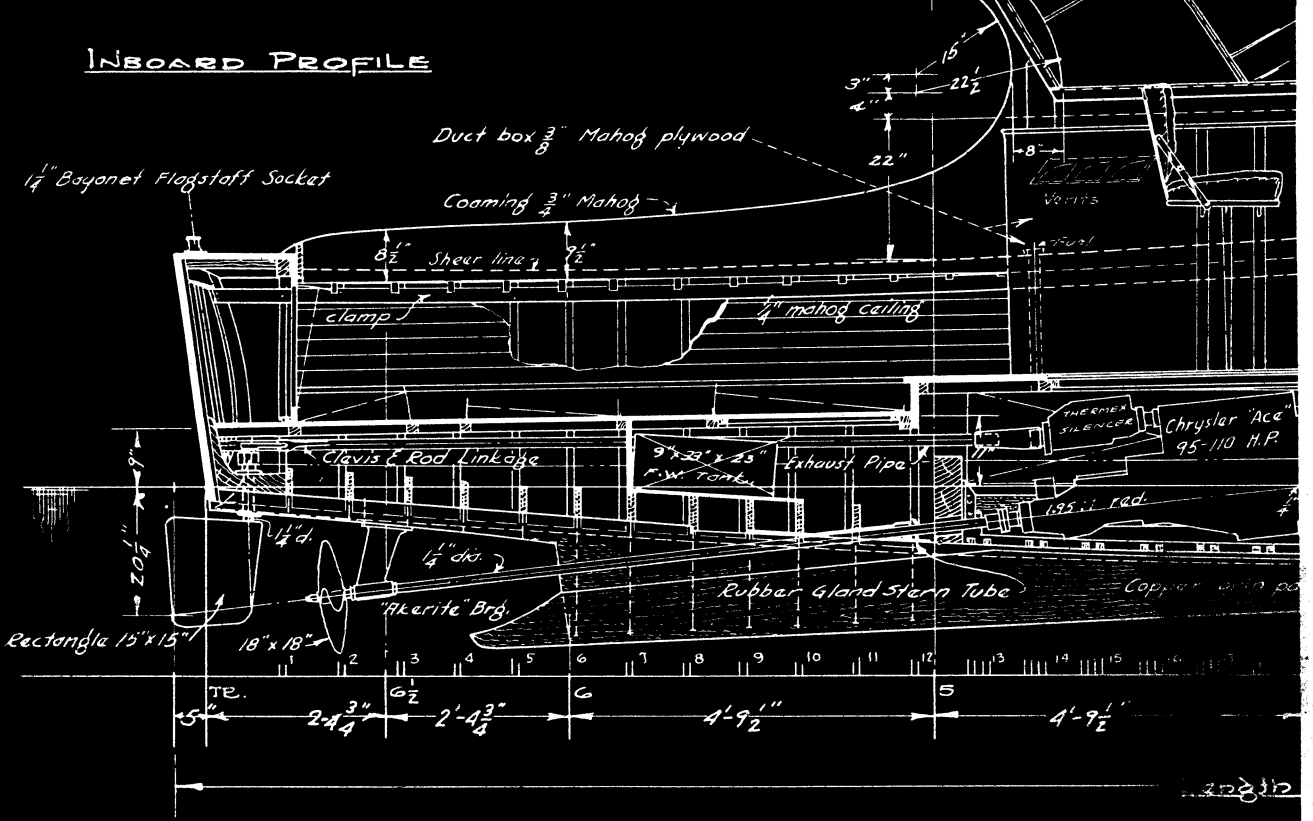
The headers from plank sheer edge to cockpit coaming and cabin coaming are 1⅛"x2" of yellow pine, with every third one of oak, ash or birch to give better end fastening. The intermediates, to save a little weight, are of the softer wood. A plate of ¾"x3", harpin-sawed between cabin bulkhead forward of stanchion 4 and up to stanchion 2 will serve to table the header ends, and might well be left in, though it is not so shown on the plan drawing. Headers are nailed to frame heads with galvanized boat nails, screwed through the molded dimension into the clamp.

The coamings are of ¾" mahogany, molded as per dimensions on inboard profile. The cabin and wheelhouse sides are of the same material. Crown mold dimensions for the wheelhouse beams are given. These beams may be sawn, but should be laminated, 1½" sided, 2" molded, of oak or ash, ¼" laminations, steam-bent and resorcinol-glued. Thus, they will hold shape. Sawn, it is doubtful. A combination of sawed-beam with steam-bent and glued mahogany under-laminate might be lasting. A good yard will think nothing of laminating the things. The coach crown for the deckhouse beams is shown in the right hand lay-off, inboard profile, and these beams also are of 1½" sided, 2" molded dimension. The beam landings must be half-gained

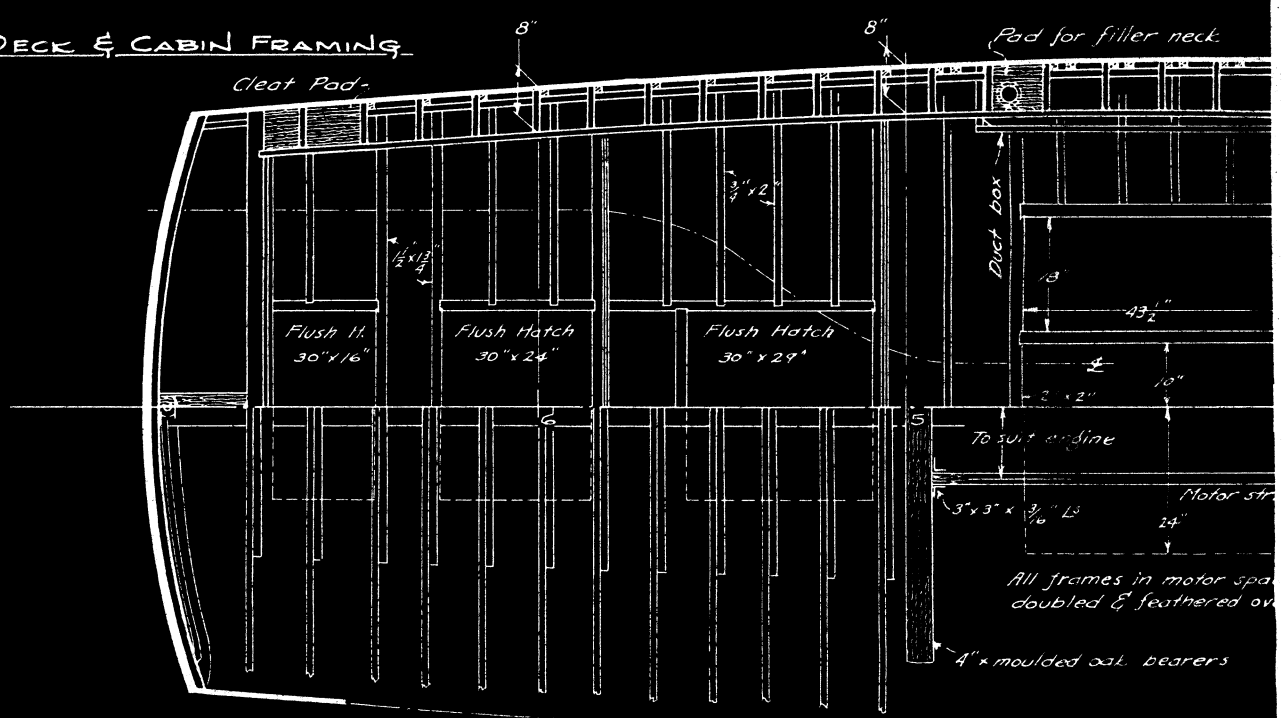


Crown Mould of Wheelhouse Beams

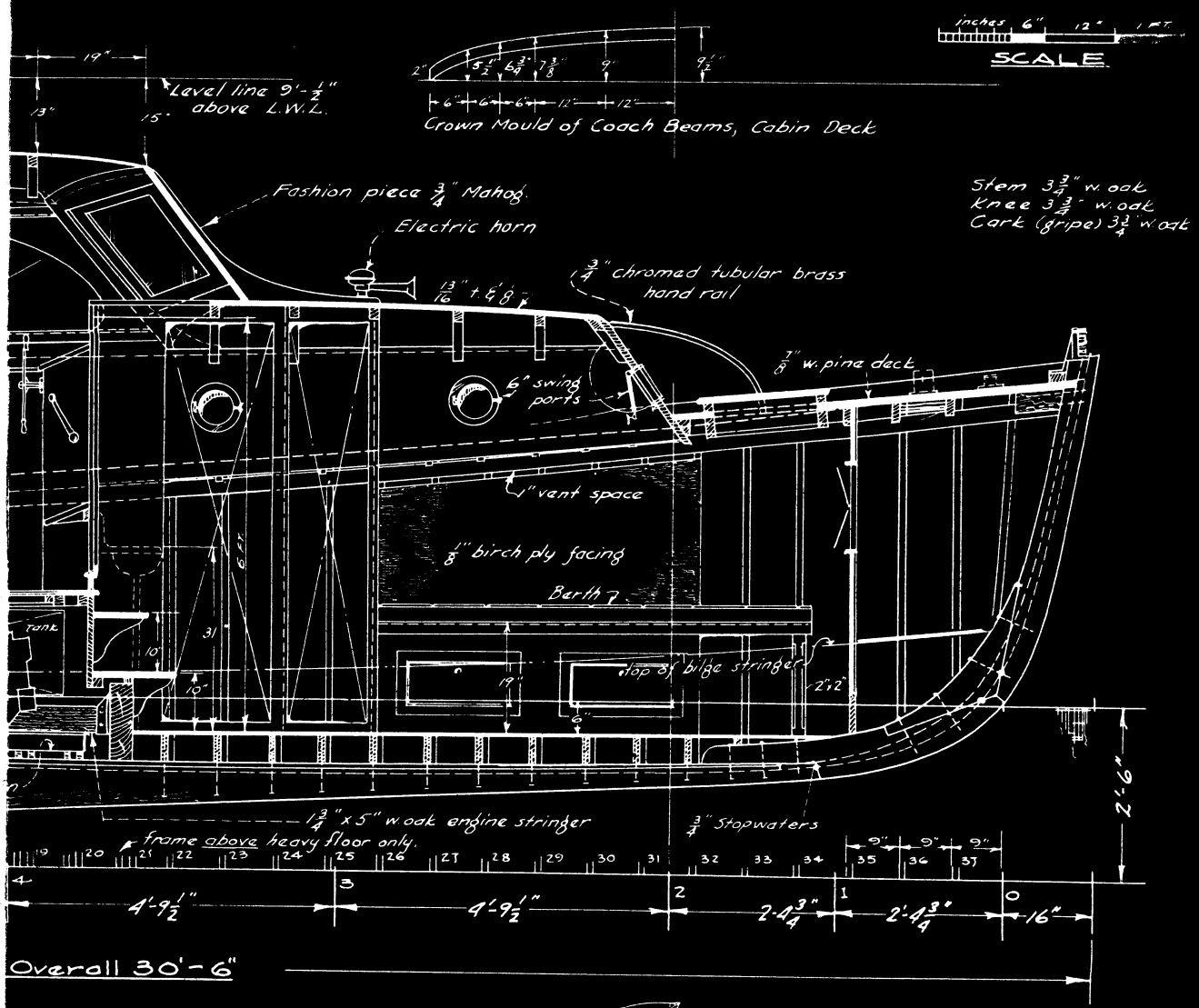
INBOARD PROFILE



DECK & CABIN FRAMING



HULL FRAMING PLAN



"SUN DOG"

Designed by
WESTON FARMER

as the detail shows. Thus they will take down-load. The forward deck beams are sized and spaced as shown.

Since the forward deck of any small vessel takes most of the topside beating, heavy decking is specified. Pine of ⅞″ thickness, covered by ¼″ plywood and canvas covered, will handle all the dock-jumping and anchor-tossing you'll ever put the boat to. The coach decking on the cabin is of 13/16″ vee-d tongue and groove white pine or cedar for the same reason. A good plan is to lay ⅛″ carpet felt over this decking before covering with canvas. The canvas may be stretched in a hot sun or warm, dry room, without bedding in paint as is usual (but prone to crack and peel), and then maybe covered with rubber base paint of buff color to give a deck that will not crack, or leak. Resiliency is a virture! The method suggested has been well-tried.

Treat the bulkheads as follows: The forepeak bulkhead can be of ¾″ plywood installed aft of the frame at No. 35, or may be placed between frame No. 34 and No. 35, which would probably be easier. The main cabin bulkhead may be of ½″ plywood with one face mahogany in the cockpit face. The bulkhead on frame No. 7 is the only watertight bulkhead, rabbeted into the floor and rivited to the frame at the skin of the ship on No. 7. It is of ¾″ plywood, marine grade, in one panel, and is watertight to prevent flooding in case of hull fracture between propeller and driftwood, which *can* happen, but seldom does, and is thus provided to give integrity to that area which is about the only troublesome point, short of violent grounding.

Now we are in the cockpit framing stage. The main headers are of 1½″x1¾″ oak-framed for openings as shown. The short headers can be of yellow pine or fir, ¾″x2″. In way of the bridge, main headers are 2″x2″ white oak, because of greater load. The short headers are the same stuff. The landing clamp for the headers along the frames at proper level is of 1¼″x2¼″ spruce, yellow pine, or similar stuff, screwed to the frames. The cockpit sole may be flat—it's easier—and covered by ¾″ marine grade plywood covered in turn by tan linoleum. Tongue and grooved fir can be used for a roughly finished job. Make it 13/16″, and paint it gray. The sole in the way of the bridge should be ¾″ marine grade plywood, linoleum-covered; ½″ plywood is too rubbery for a really durable sole. The cabin sole should be of the same stuff, with access hatches cut along in narrow openings along the keel for inspection.

The deckhouse sashes need a word: they are arranged to swing outward, and are framed of ¾″ mahogany. A fashion piece centers along the cabin deck, and against this member the raking sash frames are toe-fastened. Compo sealer should be used all around deck and faying faces.

ONE word about planking: It is to be of ⅞″ mahogany or cedar in *narrow* strakes, averaging 4 or 5″—no more. It is to be fastened to frames with galvanized boat nails countersunk and clinched, and payed with putty before sanding. To be planed to 13/16″ thickness approximately, and in no case to be less than ¾″ finished. Construction thus is of medium weight,—not light, not heavy, and amply strong to give *Sun Dog* the clean-heeled running ability which is her forte.

The covering board is to be of mahogany, ¾″ thick. The bulwark is of the same material and is screwed and bunged along the covering board and top edge of sheer plank.

For hardware: The usual white light forward, flanked by red to port and green to starboard, and a white range light atop the wheelhouse will be required by law. The galley is to be provided with a small sink, and with a faucet pump connected by copper tube and nippled hose connections to the 30-gallon water tank under the cockpit. A tee will carry water to the lavatory basin. A simple Wilcox Crittenden Cadet water closet will be installed.

Copper gasoline tanks must be dummied up to fit the skin of the frames, and will run in depth as shown on the inboard profile. One tank is to port, the other to starboard. They hold 80 gallons of fuel between them. The tanks are cross connected, with independent valves which will usually be left open for common feeding, but which may be fed independently to the main line.

The engine shown on the construction plan is the Chrysler "Ace." An even longer engine can be used—the Chrysler "Crown." If two smaller engines, such as the Chris-Craft model B, 60 hp are wanted, use reduction gears also, but shorten the engine space by installing the forward heavy bearer on frame 20. This will give spacing shown on arrangement plan. Both arrangement plan and inboard construction profile agree in cabin length, galley length, berth length. But with shorter engines, the bulkhead in the cockpit can be brought back one frame. Rather than make two separate inboard profiles for this slight change I have indicated it as described.

All engine controls are led to a control column box on which the instrument panel is located. To port of the controls hangs a compass on gimbals. The problem of ventilating the engine compartment is handled by port and starboard duct boxes framed out as shown, and covered with ⅜″ mahogany-faced plywood. The exhaust pipe leads from a Thermex Silencer into rubber steam hose nipples, thence through the transon in approved fashion.

A fighting chair may be installed in the cockpit by the addition of a large pad, and appropriate stanchions between headers and floors. Outrigging equipment is available at most marine supply stores. And with the addition of bait tank in the lazarette under the aft deck, and by adding a roller astern for boating the big ones, you have a perfectly suited fishing boat of the time-tried variety.

No blueprints of *Sun Dog* are available. The original drawings were run on Bristol board for clarity in drafting. Should you want larger detail, it is suggested the drawings here be photostated to a scale of ¾″ to the foot. That will give you a working drawing serviceable as a blueprint.

This is not a boat to be tackled by the beginner. The plans given are unusually complete from the standpoint of a yacht yard. Probably the best bet would be for the prospective owner of *Sun Dog* to get the hull built by a good small yard, and finish her off yourself. This arrangement has been highly satisfactory in a number of cases. The yard does the work it can do rapidly which you cannot do; then you do the money-saving joinery, which runs the cost up in a boat yard.

I'll be glad to hear from prospective builders of *Sun Dog* to give advice on building and on power plants.

Take her away, Skipper!

14-Foot Utility Skiff

For use as an all-purpose rowboat, kicker boat, and practical knockabout, this boat is especially good because she'll build easily and her cross-planked bottom will hold up well on sandy beach use

By EDSON I. SCHOCK

THIS skiff was designed especially for SPORTS AFIELD to meet the demand for a husky skiff that could be built easily and would stand hard work. She should give a good account of herself as a fisherman, tug, or general cargo and work boat, or a picnic boat.

The construction, with plywood sides and cedar bottom, was selected to simplify getting the hull into shape. You have to fit only one plank per side, and you avoid the springy effect of a plywood bottom.

The actual length is *less* than 14 feet, so that a 14-foot plywood panel could be used for the sides. To make her exactly 14 feet you'd need to buy a 16-foot panel.

The transom is supported with *two* knees instead of the usual one. They carry the thrust of the motor to keelsons—running almost the full length of the boat. For power, a 7½ hp motor should be plenty. A smaller motor would push her along all right, but would not leave reserve power for towing.

For safety, she should carry a life preserver for each passenger, a fire extinguisher, and if you're out at night, proper lights.

One of the first parts to make is the *stem*. On the drawing, two types are shown. The two-piece stem is the easier to make. For this a piece of oak 1¼"x3½", 2' 3" long will make the inner part, and another bit 1½"x 2⅝", 2'4" long the outer. All you have to do is plane the bevels on the sides.

The one-piece stem is a better job, and more shipshape. For this one, a piece of oak 2½"x2¼", 2'4" long is needed. Mark the face of the stem on the 2¼" side of the piece, ½" wide. Plane the bevels to 35° as shown. The cuts for the rabbet may be made on a circular saw, or by hand. But in either case they should be smooth and square to receive the ends of the side planks. Notch the bottom end for the bottom planks. This is shown on the inboard elevation drawing.

Some boatbuilders give oak a coat of shellac as soon as the piece is finished, to retard checking. If left in dry air, oak seems to check badly in a short time.

The *chines,* or nailing strips, should be made ready. These are simply two pieces of oak, ⅞"x1½", 14' long, planed on three sides. The bottom need not be planed now. It will be bevelled later.

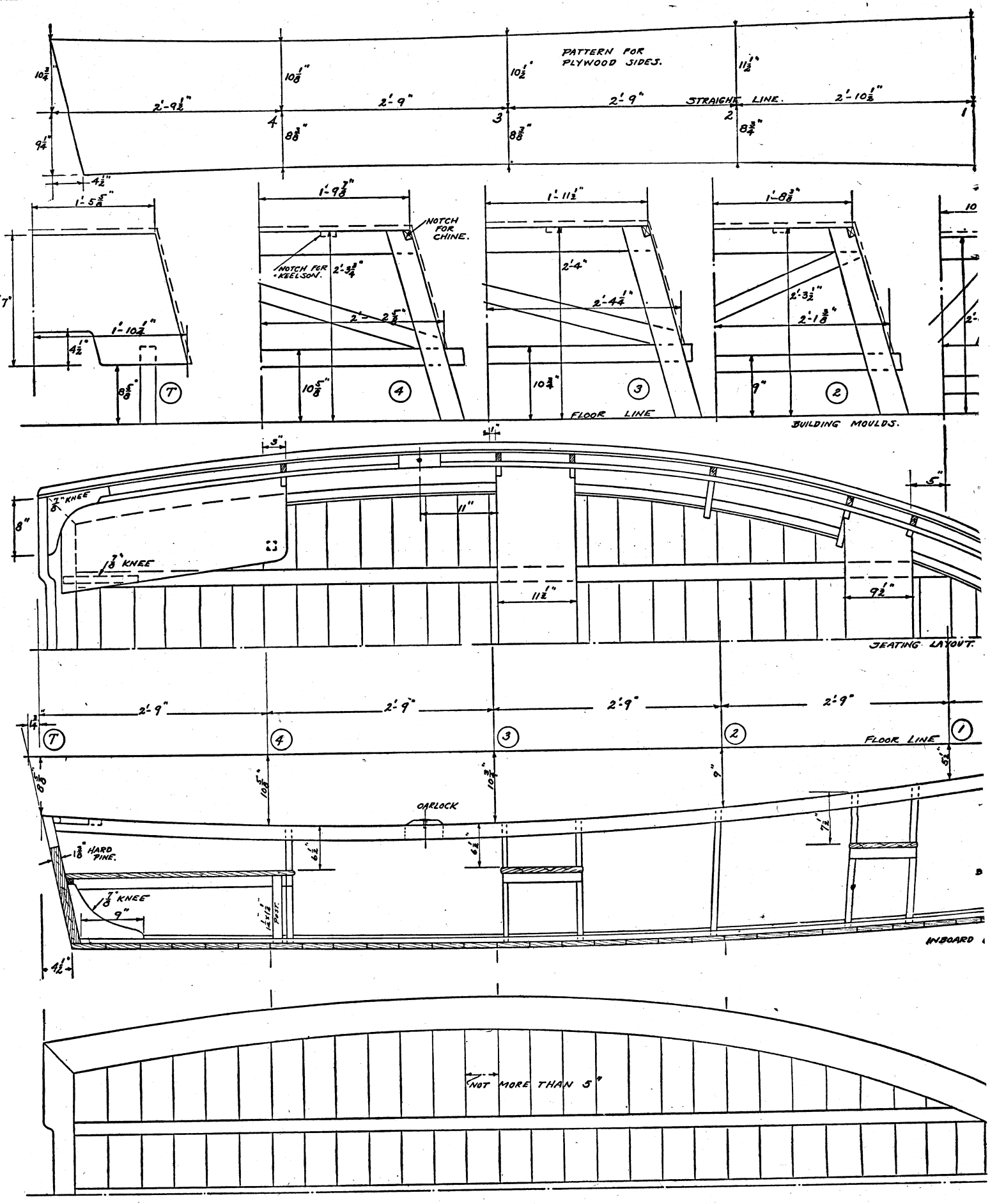
The *transom* can be made next. To take an outboard motor, this should be a strong wood like hard pine or oak 1⅜" thick or *more*. The individual boards should be splined or doweled together, and glued with waterproof glue. Clamp or wedge the boards together, and let the glue set overnight.

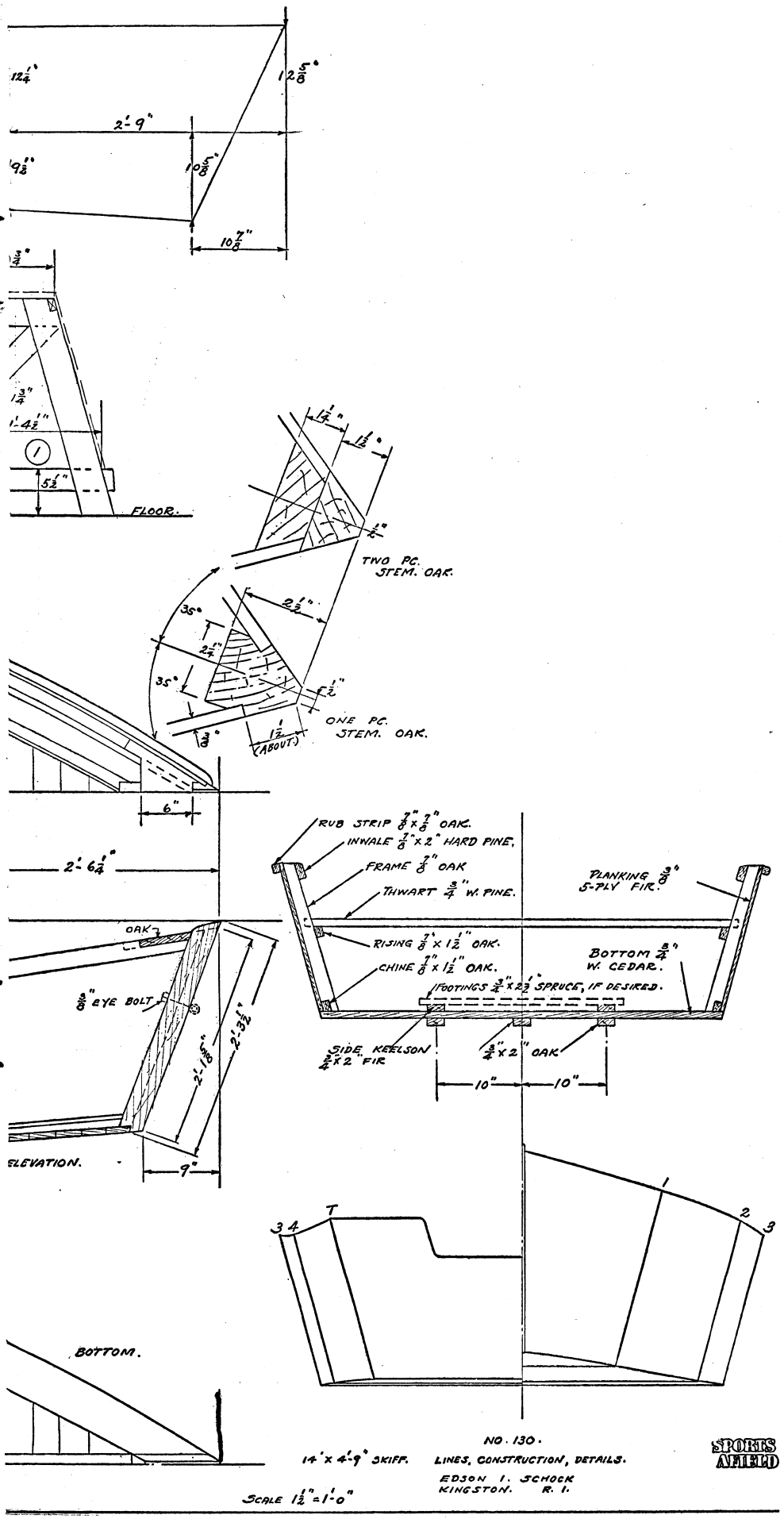
In making the transom, allow ¼" on the bottom and sides for bevel. The transom drawing shows the shape measured to the inside of the planking, so you do not have to allow for planking thickness. For a heavy, powerful motor, a reinforcing piece up the middle of the transom on the inside may be desirable. A piece of ½"x12" oak would be about right.

The *side planks* are cut from ⅜", 4'x14' plywood. Use the best marine grade of waterproof plywood. Your lumber dealer may have to order it for you. The layout of these planks is marked "pattern for plywood sides." To draw this on your plywood, draw the centerline first, then the cross lines at right angles, spaced as shown. Mark off on each line the distance shown. Mark the end bevels. With a wood strip, or batten, draw the edges of the pieces. Saw just outside the line to allow for planing smooth.

If one side of the plywood is better than the other, arrange to have the good side on the outside of the boat, making the side planks right- and left-hand.

On any plywood pieces, paint the edges with plywood sealer as soon as they are planed. This keeps the water away from the glue on the inside of the panel. While this glue is waterproof, a good many boatbuilders do not tempt it, but protect it from water as far as possible.


PATTERN FOR PLYWOOD SIDES.
STRAIGHT LINE.
2'-9½"
2'-9"
2'-9"
2'-10½"
FLOOR LINE
BUILDING MOULDS.
NOTCH FOR CHINE.
NOTCH FOR KEELSON.
SEATING LAYOUT.
7/8" KNEE
OARLOCK
1⅜" HARD PINE.
NOT MORE THAN 5"
INBOARD



The author has seen waterproof plywood come unglued just by being left outdoors in the shipyard for a few weeks. This was U.S. Navy inspected stock, and supposed to be first-grade.

Next we can make the *molds.* These can be of any scrap crating or other lumber, and need not be planed except on the working edges. They should be strong. Make the molds for building the boat *upside down,* with the side pieces long enough to reach to the floor. The floor line is shown on the plans, and dimensions given from it as a base line. The mold dimensions are given to the *inside* of the planking. The cross braces at the bottom are set at the right height for the top edge of the side planks to rest on them.

Notch the corners for the chine pieces, and notch the bottom cross members for the side keelsons. Cross brace as necessary to make each mold good and stiff to stand pushing and pounding. One half of each mold is shown. You make both halves. Mark the *centerline* on each. Mark *number* on each.

Now we have enough parts to start building the boat. On your shipyard floor, snap a chalkline for a centerline, and measure along this line to locate the mold stations. At each station, draw a line across at right angles to the centerline to locate the mold. Mark the location of the head of the stem and the extended line of the transom.

Set up the molds plumb and square, and the transom and stem at proper angles. Fasten down and brace well. In setting molds 1 and 2, the *forward* edge of the mold comes on the station line. In numbers 3 and 4, the *aft* edge on the line. The stem and transom will need a little temporary bracing, until the side planks are on.

Next fit the chines into the notches of the molds and fasten them to the stem and transom. A nail at each end will do this. Use *bronze* or *galvanized* nails. Now fit the knees for the side keelsons. Fasten them to the transom with long Everdur screws. Then screw the side keelsons to these knees, and bring them forward in the notches in the molds. Fasten them to the chine at the forward end. This should be a temporary fastening, as the keelson may creep a little as you plank the bottom. These keelsons should be well fas-

tened at the transom, because they take most of the thrust of the engine.

The side planks come next. Hold the side plank in place against the molds. Fit the joint at the stem. (If a two-piece stem is used, this need not be fitted.) The joint between the planking and the stem should be *carefully* fitted. Good work here makes a nice looking hull.

A professional boatbuilder looking over your work will always look at the fit between the planks and the stem. Mark the position for the screws. *Do not put screws in line* along the grain of the stem, but *stagger* them a little to prevent splitting. Everdur bronze screws are good for this job, the 1" No. 8 size, spaced about 2½". Drill the oak using a No. 40 drill, and soap the screw threads. Do not fasten the plywood in place just now, but put in three or four screws driven only half way to hold it temporarily.

WITH the plywood clamped to each mold, mark the screws for the transom end, and all along the chine. Mark where the bottom of the chine comes on the plywood. (The bottom is the top since the boat is upside down.) Remove the side plank, drill for the screws, but *do not countersink* for the screw heads in plywood.

Paint the stem rabbet, the edge of the transom, and the chine, with seam compound. Do the same for the plywood edges where it comes in contact with the stem, transom and chine. Put the side back in place and screw it to the stem, chine and transom. Seam compound is made by several of the marine paint companies. Your local boatbuilder probably has some to sell that he has found works well.

At the bow and stern use 1" No. 8 Everdur screws; along the chine ¾" No. 7 spaced 3".

If you fastened the chine pieces to the molds, remove these fastenings before you put on the planking. If the chines are fastened to the molds you can't get the molds out of the boat when the time comes.

Some time before the bottom is put on, the edges of the side planks will have to be planed square across and the bottom edge of the chine bevelled. For this operation make a straightedge of white pine or spruce, a little longer than the bottom beam of the boat, say about 4½' long. Resting this on the edge of the plank, plane the bottom straight across to receive the bottom planks. Keep both sides going at once by planing a little on one side then a little on the other, and make the fit a good one. Poor work here will make a leaky boat. One little misfit and the water will find it and rush happily in. When the plywood edge is planed, paint it with plywood sealer.

Next put on the bottom. The planks are ¾" white cedar, *not over 5" wide.* Wide planks warp and swell and make trouble. Fit the inside edges tight, and leave the outside edges open a little, say 1/16", for caulking. The caulking bevel should be about half the plank thickness, so that the cotton does not go through to the inside. Cut the ends to the bevel and angle of the side of the boat with the bottom board resting on the chines and plank edges. Leave very little for planing fair and smooth.

While you are sawing off the ends, the plank can be clamped to the side keelsons, and it should be fastened to them as soon as it is fastened to the chines. Screws for the bottom planks can be 1½" No. 10 Everdur. Use a No. 33 drill and soap the screw threads. A bit brace screwdriver will be good for this job.

The joint between the plank and chine should have seam compound. Many builders lay a small thread of caulking cotton on this seam before setting it up. Do not put in too much cotton, and make a lump.

Screw the planks to the side keelsons, *one* screw at each side of each plank. When the bottom is all on, plane the ends of the planks fair with the sides of the boat, and paint the end grain all around.

For caulking the bottom a caulking wheel is the best tool to use. Roll a strand or two of cotton wicking into each seam, starting at one end of the seam and working along to the end opposite. Roll the cotton in about half way to the inside of the boat. Do not push so hard as to drive it all the way through. Paint the seam with thick paint.

When the paint is dry, plane the outside smooth, and paint the bottom one coat. Then fill the seams with seam composition, and paint another coat. If the boat is to be kept in salt water, use copper bottom paint on the bottom, all coats. Put the copper paint on the bare wood, no undercoat.

The bottom rubbing strips, of ¾"x 2" oak can now be painted on the side coming in contact with the bottom, and can be screwed on. Bevel the bottom edges, and paint.

Now take the boat off the molds. Brace the boat temporarily across the top until the thwarts are in.

Make and fit the frames. Fasten them to the planking with ¾" screws, put in from the outside. Fit the risings while the boat is level. Then you can use a level to get the seats level. Fit the thwarts, making them good and strong. *Someone* may jump on them some day. Not good practice, but some folks are not careful with boats.

The rubbing strips are screwed on from the inside, using ¾" screws, and should be at least ⅞"x⅞" as shown, because they support the upper edge of the plywood.

The inwales go in next, with knees at the transom, and breasthook at the bow. Use one 1¾" or 2" No. 12 screw per frame. Drill to prevent splitting the frame. Inwales must be strong enough to be used for lifting the boat.

Fit the rowlock socket blocks, the mooring eyebolt, lifting rings, cleat for towing another boat, and whatever hardware suits your fancy.

Paint the inside and outside of the boat, enough to cover well. The inside of the bottom might have nonskid paint to prevent slipping. This paint is made by several marine paint companies, and works well. *Do not* put it on the thwarts or seats, as it will wear out the seat of your pants or bathing suit.

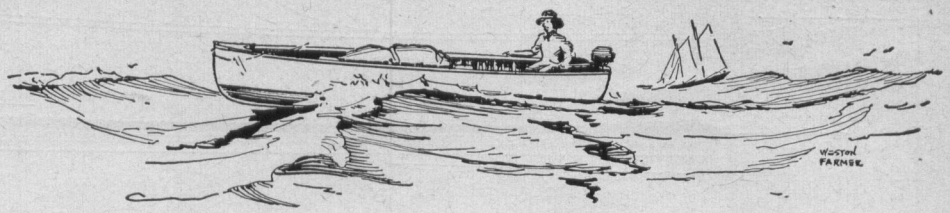
Foot rests, shown on the midship section drawing, may be added if you want them. They keep your feet dry if a little bilge water is sloshing around.

A little varnish work will dress up the boat and add much to her appearance. It is some work to keep it looking fresh and good, but not too much. And it gives her a finished appearance. Even if you do not want any varnish work to take care of, you should varnish the rubbing strips so that your boat will not mark other boats if she rubs against them. Rubbing strips painted bright colors leave marks on the hulls of other boats. This shows that the owner does not think of the other fellow.

After launching, let the bottom swell up a couple of days before using the boat. She is much stronger when everything is tight.

SCAMPER

How to Build a Strip Boat



Scamper loves the big stuff and will haul great loads of duffel.

By WESTON FARMER

WHETHER YOU cruise along the rockbound coast of Maine or on the mellifluous waters of the Chattahootchee, chances are you've ridden in a strip boat. They're everywhere.

And there is good reason for this. Time was when boatbuilders could spile a plank and fay a sawn frame, and thought nothing of building up a complete planked and framed-out clinker hull in one day for eight bucks. But now—well, since anybody can nail one strip to another all day long, the boss hands a crew of two a bunch of slats, a transom, stem and keel, a power sander and says, "Last man done is a monkey's uncle!" And the art of boatbuilding becomes a nailing contest.

Which is just as well, I guess. What with a lot of things in the world being bastardized and watered down, it probably is good that the strip boat holds up. It has a rugged hull, of true boat shape, and one that requires a minimum of preparation for building since it fairs itself as you build and there is little need for lofting.

The theory of the strip boat is so simple that just about anybody can grasp it. You have a transom, naturally, and a keel with an inside rabbet, and a stem. The girths are all equal in that portion of the hull where strips apply—any differences in hull girth from the lower edge of the strips down to the rabbet are absorbed in one wide plank called the shutter, or stealer.

To reverse the illustration: the stealer is fastened to the rabbet, and from that point up to the sheer, all the planking is in narrow strips, edge-nailed to each other, with girths from shutter or stealer to the sheer line all equal at each mold station.

To provide a boat of this simple construction I have designed and built *Scamper*.

Scamper is 14 feet over-all; has a 50½-inch beam; is 19 inches deep; weighs about 155 pounds dry. She'll do 12 to 14 mph with from 5 to 7 hp, and materials will cost you about $50.

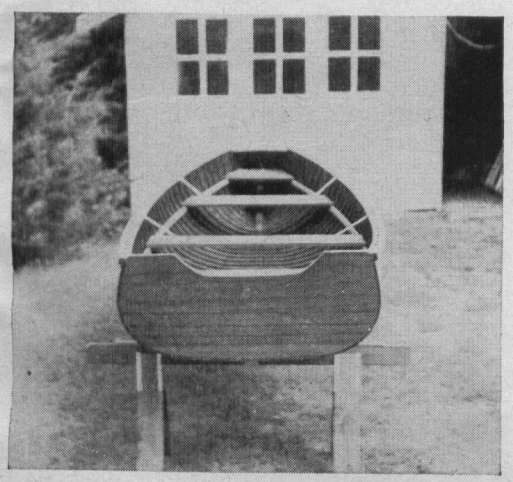
Study the outboard profile and arrangement plan. You'll see a boat of normal form, with a stern seat open at the aft end, so you can bail. You'll see a skeg, which is not needed at all, but which can be used if you fancy one.

If you're a cruiser born, and like to lope it on long jaunts, a ridge pole and a pliofilm or duck spray hood will keep your duffel dry. *Scamper* will do the rest. She is eager; loves her work; likes the big stuff; will haul a great load.

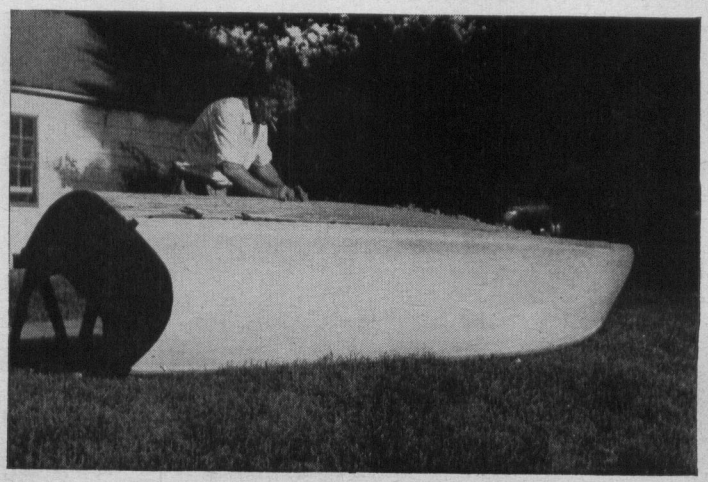
For her construction, you'll need the following materials: 14 pieces of red cedar rift sawn (edge grain) for planking. These will be rough sawn 5/4" stock, 15′ to 16′ long and at least 6" wide. Pick it out yourself if possible. Thicknesses of rough lumber are generally uniform, but lengths and widths vary widely.

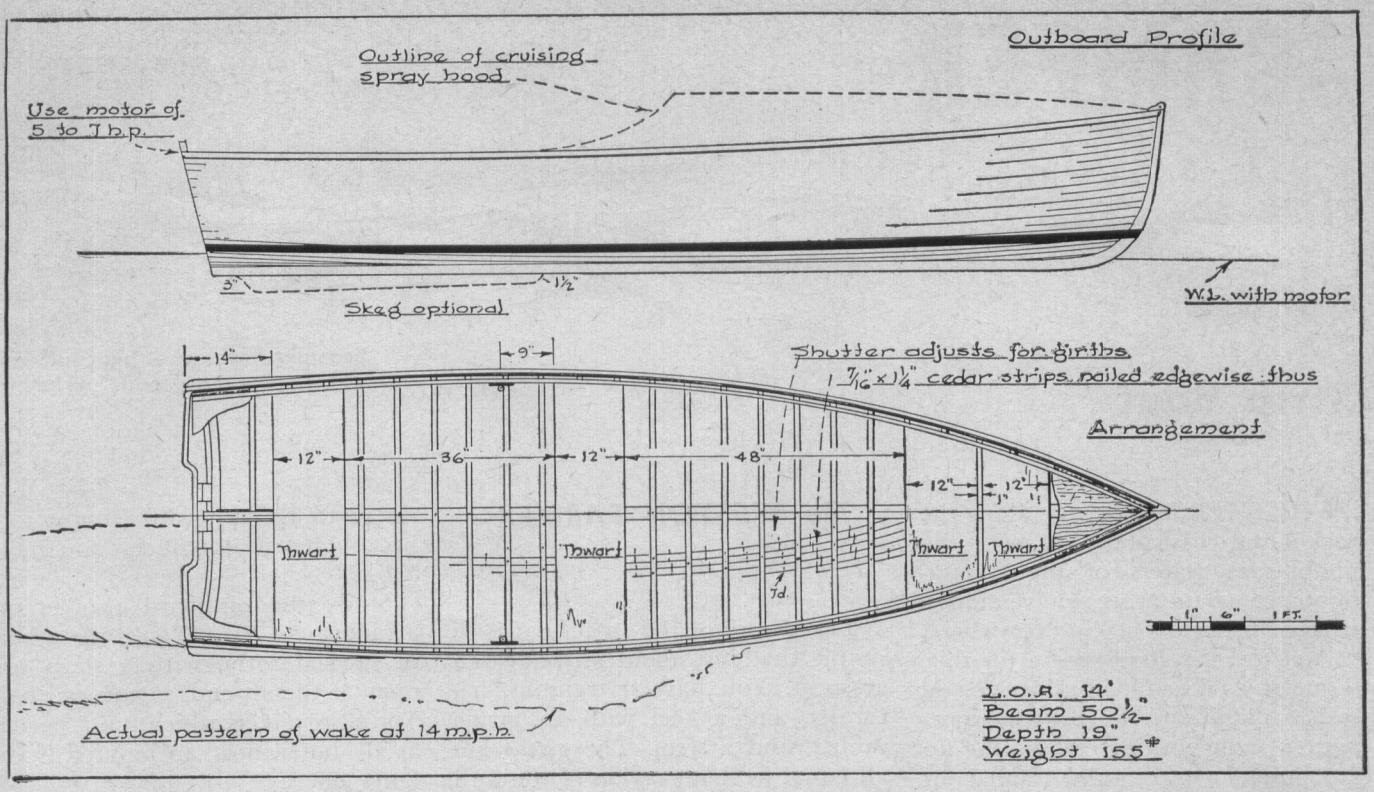
I paid $1.80 per board for my stock. It will cost less on the West Coast, more in the East. A piece of

Here the hull has been trimmed out with risers, wales and seats.



Weston Farmer, Scamper's designer, at work planing and sanding her hull. Note beautiful finish of hull.





An ideal arrangement, proved by usage, is dimensioned above. In the profile view an optional skeg is shown; also the outline of pliofilm spray hood.

2"x2"x12" white oak makes the keel. One piece of 2"x8"x4' white oak makes the stem and knees. One piece of 2"x12"x5' makes the mahogany transom. Four pieces of 5/4"x6"x8' green bending oak (white oak) makes the frames. One piece of 1"x5"x16' oak, mahogany or fir will be needed for the wales and risers.

If you can't find old 2 x 4's around your shop, you'll need to corral about 60 lineal feet of this stuff, No. 3 or worse, to make the stocks from. In addition you'll need about 4 pounds of galvanized shingle nails, and about ten pounds of 7d galvanized flathead nails for edge nailing the strips. Paints, a few sundry screws, and such things as sandpaper will be needed.

Plane up your framing oak first. Out of the stock you have bought, you should get 1" thicknesses, and slightly more than 4" widths easily, as depicted in Fig. 1. In Fig. 1-A you see the method of marking. In Fig. 1-B you'll see how the necessary edge grain is obtained by ripping.

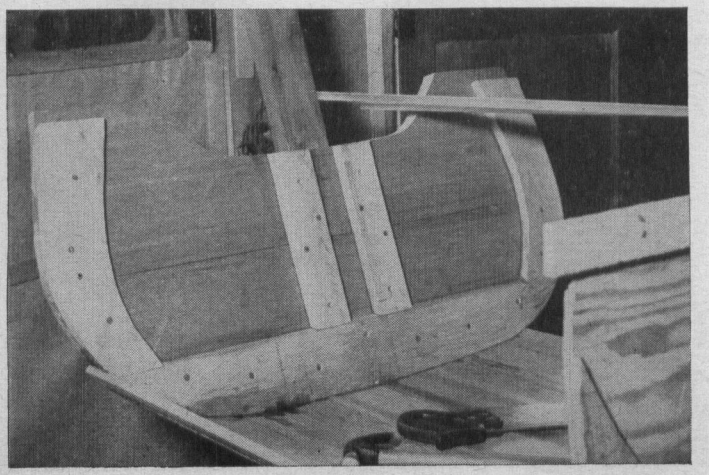
I know that most theories call for flat grain in bending oak. But the boards you buy are seldom cut that way, and the edge grain on so light a frame works all right, I have found.

Subtracting the saw cuts, as at Fig. 1-B, you'll get two strips each about 7/16"x7/8" with the right and left faces planed.

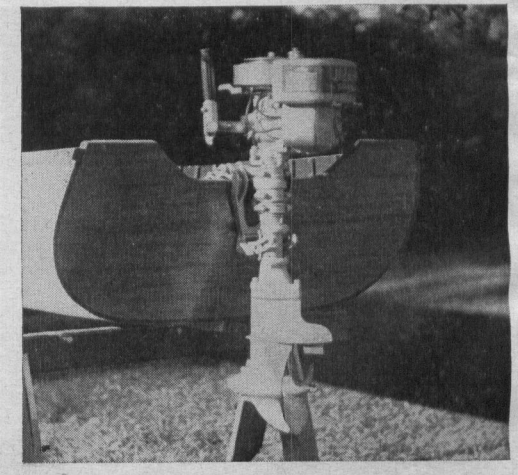
Knock off the rough 7/16" sides with a standard radius knife in the shaper as at Fig. 1-C. If you don't have a shaper, buy the knives and let your local sash and door factory run the things out. It will only take about an hour of machine time for all 27 frames in the boat, including the short frames forward.

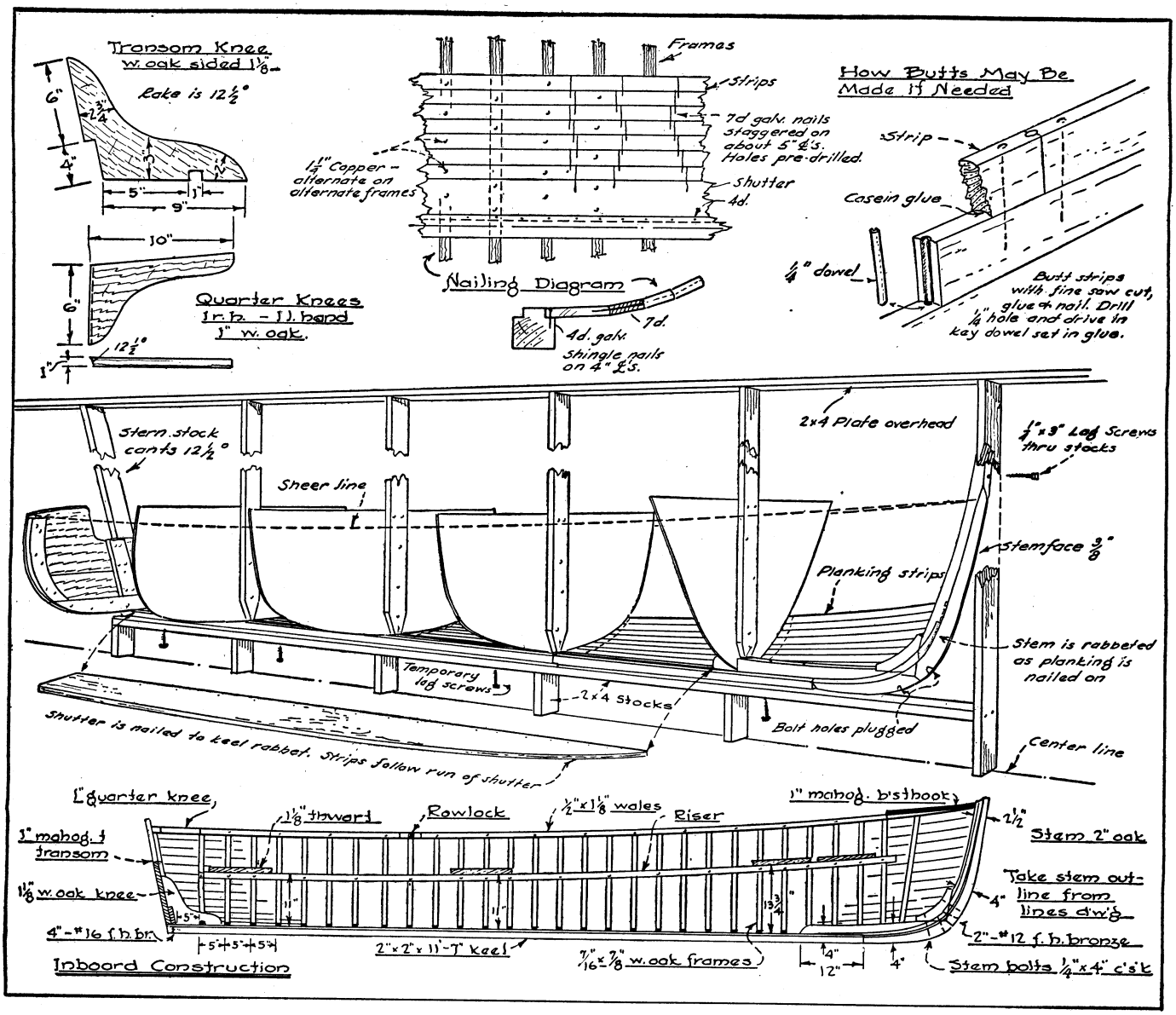
I have allowed for 32 to 34 frames in the materials list. This gives mar-

Here's a good shot of the transom and cheek pieces. Planking has progressed on both sides to bilge turn.



The transom is cut to let the cavitation plate line up below keel.





A 2" x 4" plate is scabbed to the shop tie rafters, and 2" x 4" stocks are set up on which to lay the keel and erect the molds. Note copper clinch nail scheme.

gin for occasional breakage. Put the frames in a pile of wet sawdust, or wrap them in gunny sacks and keep them watered by sprinkling until you are ready to heat them.

You get the planking strips out as shown in Fig. 2. Your 5/4" stock will probably average 6½" wide. Mark as in Fig. 2 and cut horizontally as shown. Use a thin planing saw blade.

If the table saw won't handle a full-depth cut, finish the job by hand ripping as the sketch depicts. Plane only one face of the board to start with. Use careful cuts with an eye to saving as much thickness as you can.

This will give you rough strips of cedar about ½"x1¼". By kissing off the lower half of the split board in the planer, you can thus get all the *inboard* faces of the plank strips smooth. Leave the saw marks and fuzz for the outboard face—planing and sanding later will take care of that.

You'll end up with strips roughed at about ½"x1¼". By the time the finish sanding is done, the thickness should be no less than 7/16". The 1¼" dimension may go down to 1⅛" by the time the hollow and round is put in on the shaper as per Fig. X. Therefore I have nominated several sizes to call attention to the fact that there are maximums and minimums.

Your strips are now gotten out. The next step is the building stock and the transom, keel and stem.

The stocks are shown above and require little explanation. They are of 2"x4" and at a good working height. This makes building easier.

Next make the molds. These are of ⅜" plywood preferably, but may be of scab lumber. Whether to loft or not is up to you—if you can get fair curves for the sections on the dimensions in the body plan, all well and good. If you'll realize that the plans are drawn 1/16 full size, you can see that even the width of a pen line on the plans can scale ½" off from actual, so if the dimensions shown are not right on the button don't get in a stew—just average them out to fair curves, preserving the general size, and you'll be all right.

If you hit this condition, perhaps it would be best to start from scratch and lay the whole job down on paper taped to your dining room floor, running in all waterlines as

close to dimension as the batten wanted to go, and making your mold body plan from that.

I can hear somebody say, "Whyncha make up yer mind?" I could lay the thing down full size in my design office, but you couldn't duplicate that because the columnar consistency of your batten wouldn't be the same as mine. No two boats lofted in different locations are the same. The pro boatbuilder would use the molds as a guide to the shape, knowing that the planking will stand away from the molds anyway.

Erect the transom stem and keel on the stocks, fastening the keel and stem temporarily through the 2 x 4's with 3" long 1/4" lags.

Put a batten around the molds when they are erected at the sheer line. Make a thin batten about 1/8"x1/2" of oak. Mark on this batten from the end, the distance of 24 or 25 of your compacted planking strips. This is the girth of the strips from sheer to shutter.

Place the sheer mark on the batten on the sheer mark on the mold, and bend the batten around the mold. Where the end of the batten terminates at the bottom of the mold, place a mark. The distance between this mark and the inner edge of the keel rabbet is the width of the shutter at that mold.

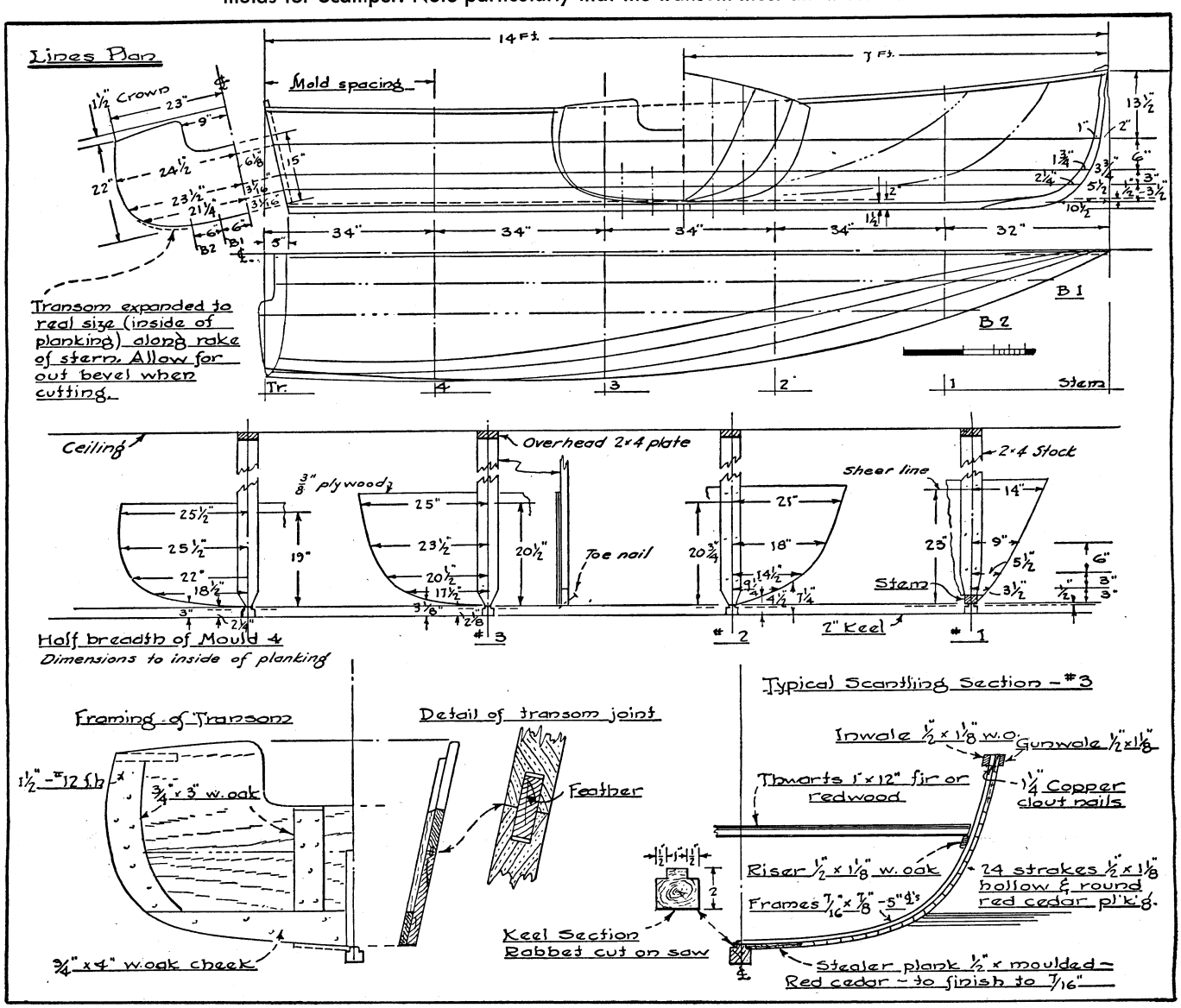
Lay off these distances on the shutter board, join the points fairly with a batten, and saw out the shutter planks. Do them both at once to assure evenness of girth at all molds.

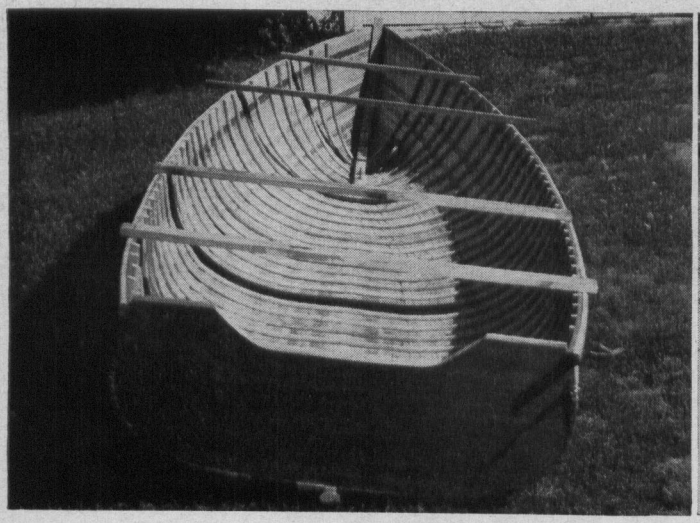
Spread casein glue on the rabbet, place the shutter into position, and nail every 3" with galvanized shingle nails into the keel of Scamper.

Now you start planking. Scuff off the hollow of the first strip with a plane. Taper the fore end of the strip to fit the rabbet forward, and nail the strip edgewise every 10" or so with 7d galvanized nails. After nailing each strip to its neighbor, put a light pencil mark inboard, indicating where the nail is. This will help show you where the blind nails are when you're framing.

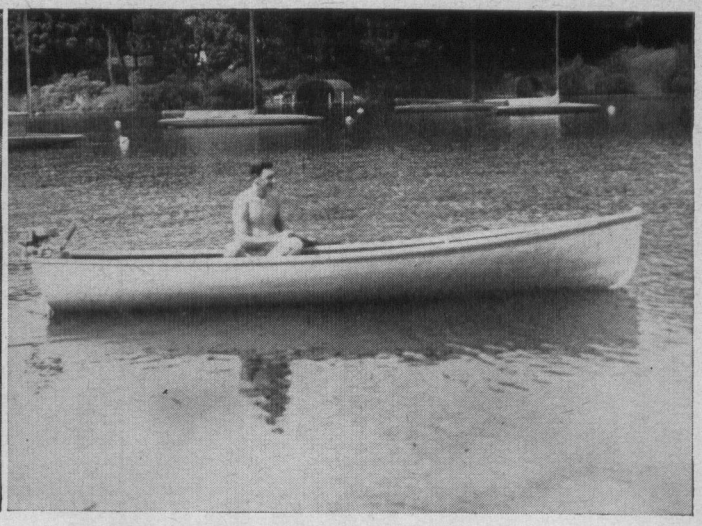
Use an "egg beater" and a drill to pre-drill for all nail holes, else the strips will split. It's best to paint casein glue in the hollow of each strip as you go. This tightens the boat, preserves shape in framing. Cut the rabbet in the stem as you go, having someone buck your cut with a heavy wood block. This method assures each strip laying in correctly.

The lines plan below will supply all dimensions necessary to make up the molds for Scamper. Note particularly that the transom must allow for bevels.





Here the strip planked hull has been framed out and cross-spalls tacked across the wales to hold hull shape.



Scamper poses with crew member just after launching. Note buoyant trim and her long, graceful hull lines.

After carrying the planking to the sheer, the boat is framed. Use an old section of rain spout with soldered end piece over a good wood fire to soften the frames. Fifteen minutes of boiling will make the oak say "Uncle."

Mark for the frames inboard, drill every other strake for the 1¼" clout nails, put the nails into these holes, and then, with a helper, nail the frame to the keel with a galvanized shingle nail and, with a weight to buck (called a clinch iron), nail the frames in.

With boiling, the frames will take about a day to put in. If you can rig a steam box, you can do it in half a day.

While the frames and the nails are still warm and before the copper has crystallized, use a broadfaced nail set and buck the clout nailheads into the planking so the outer skin can be planed.

That's about it, Mates. I can think of only one or two points more. Use two shingle nails per strake into the stem, two per strake into the transom cheeks, one 7d per strake into the mahogany transom.

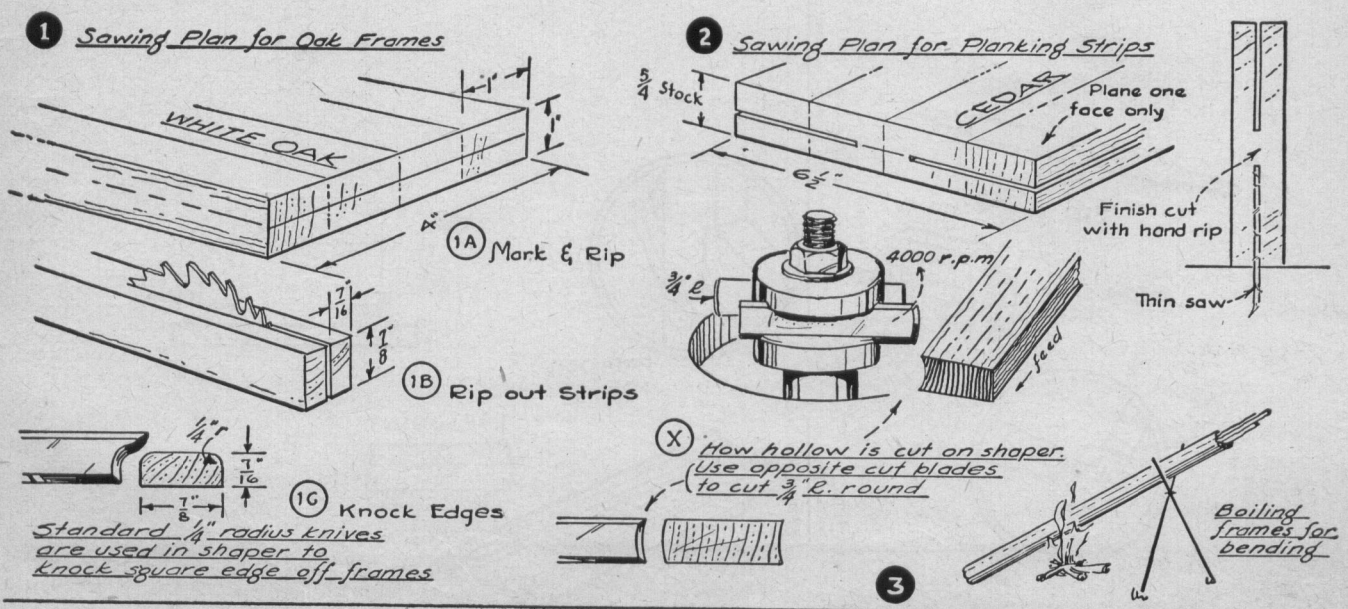
If the planking runs into an uneven sheer, as may happen on your first boat, use a wider sheer strake, edge nailed with finishing nails, which can be set as deep as needed, and the sheer line can then be planed to a fair sweep.

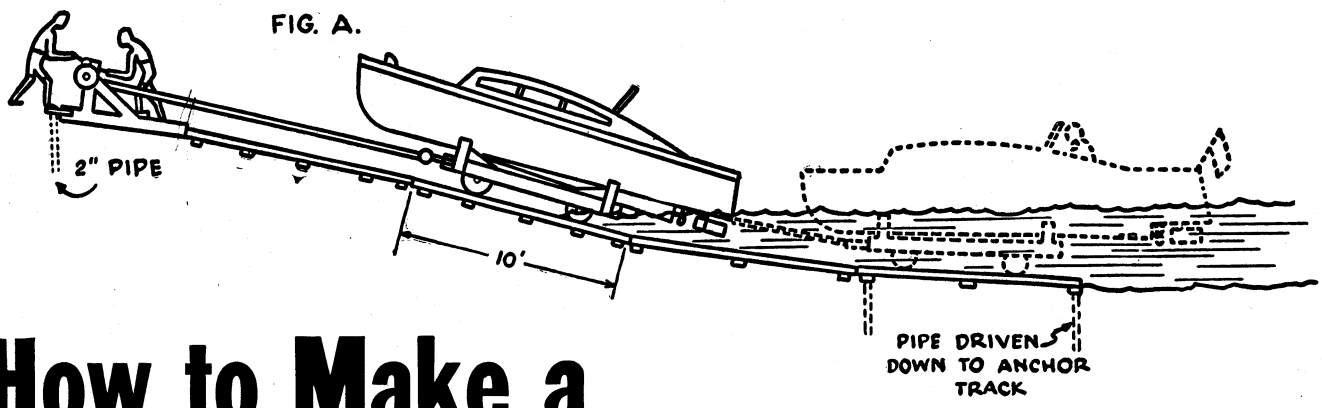
Next put cross-spalls from sheer edge to sheer edge, remove the molds, paint the inboard planking, run in the wales and risers, cut the thwarts, turn her over and plane, sand, and paint.

A boat built of small pieces like this goes together easily. All it takes is gumption.

Getting a start is most of the battle —using the old bean is the rest of it. And *Scamper* here is a little sweetheart if you ever saw one.

Aside from the ease of building, a strip boat uses very few boards. Oak and cedar are re-sawn in your own shop to give low lumber bill.





How to Make a MARINE RAILWAY

By HI SIBLEY

HERE'S an effective and easily-constructed project for hauling that big boat out of the water for bottom repairs or cleaning. And it's no chore to dismantle the setup since the track is made in 10-foot sections bolted together.

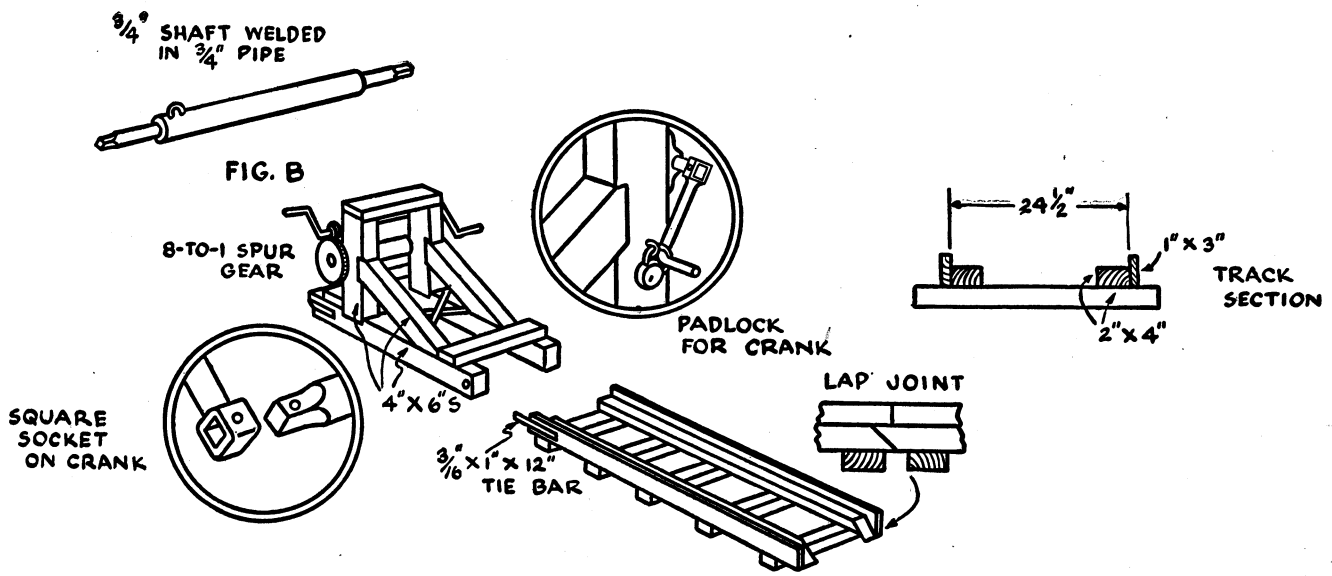
In Fig. A is the layout. The dotted lines show the craft approaching the car in shallow water. In fact the car is drawn in simultaneously with the boat until it rests firmly in the cradle. Two men at the winch can draw the boat up completely out of the water.

Winch details are given in Fig. B. Spur gears usually are available at a machine shop or can be picked up in a junk yard. Assemble them on ¾" cold-rolled steel shafting that turns in pillow blocks, or other available bearings. Note that cranks have *square* sockets, and are removable. Some sort of lock should be provided to prevent inquisitive kids from pinching their fingers in the gears.

Track is made up of 2" x 4"s with side members, 2" x 4" ties. End joints are lapped. They are linked together with the side bars. On dry land, sand should be scooped out for the ties so that the rails rest on the sand for support when heavy boats are hauled over them.

Dimensions of the winch are given in the two views: Fig. C, which shows the sturdy construction—Length of the car, Fig. D can be adapted to larger or smaller boats. Here it is dimensioned for an 18-footer. Before making the cradle, get a pattern of your boat's bottom. V-bottoms require only flat members, but for a roundbottom, the cradle pieces will have to be band-sawed. Also for a round- or flat-bottom sailboat with deep keel, allow keel clearance, as shown in Fig. E.

The perspective, Fig. F, shows all details of construction, and note that the cradle members are padded with canvas, not rubber. A wet boat slips on rubber. Bearings for the wheel axles can be made of a short piece of ¾" pipe welded to a flat plate, but a standard pillow block will be more satisfactory. Pack the bearings with salt-water grease, and paint all metal work with red lead, especially if the rig is to be used in tidewater.



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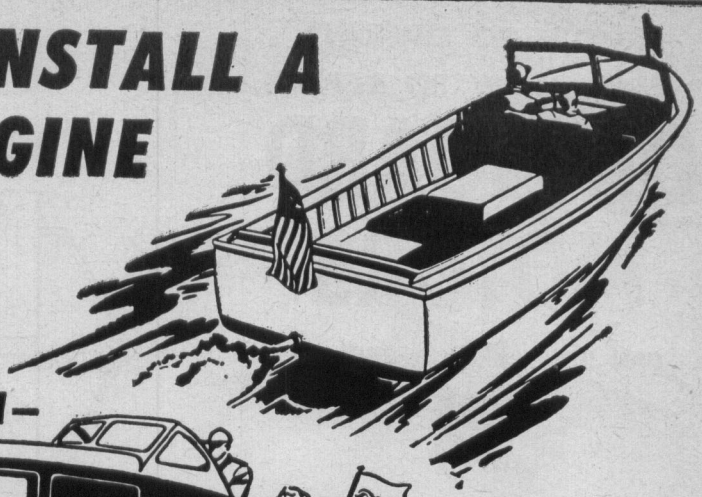

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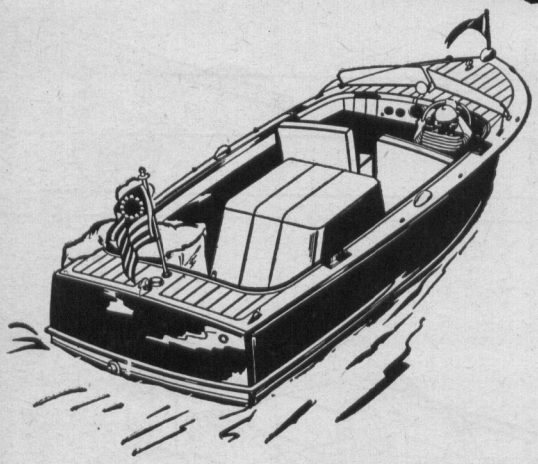

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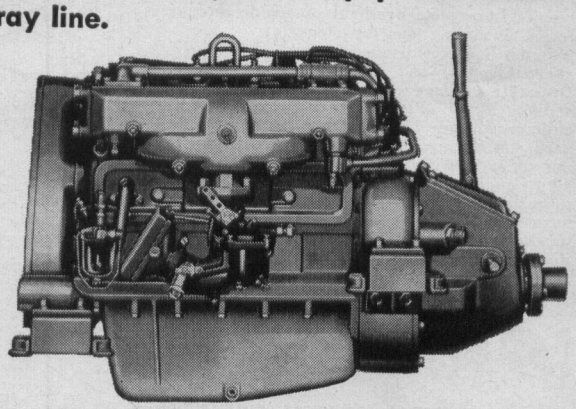

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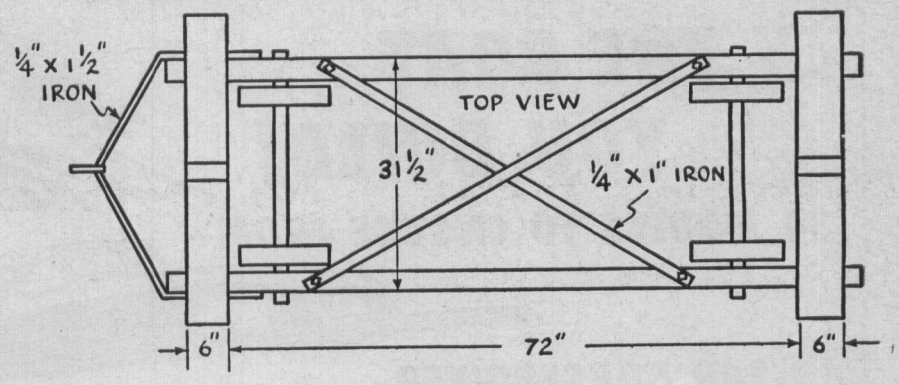
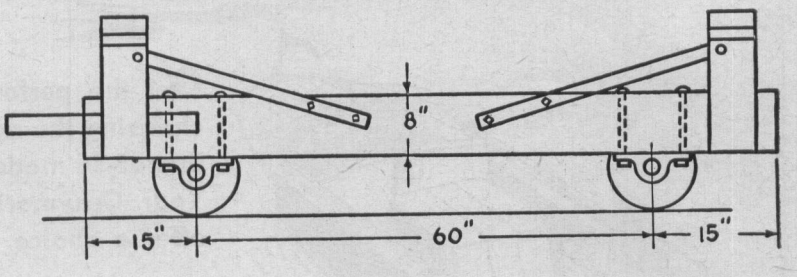


FIG. D



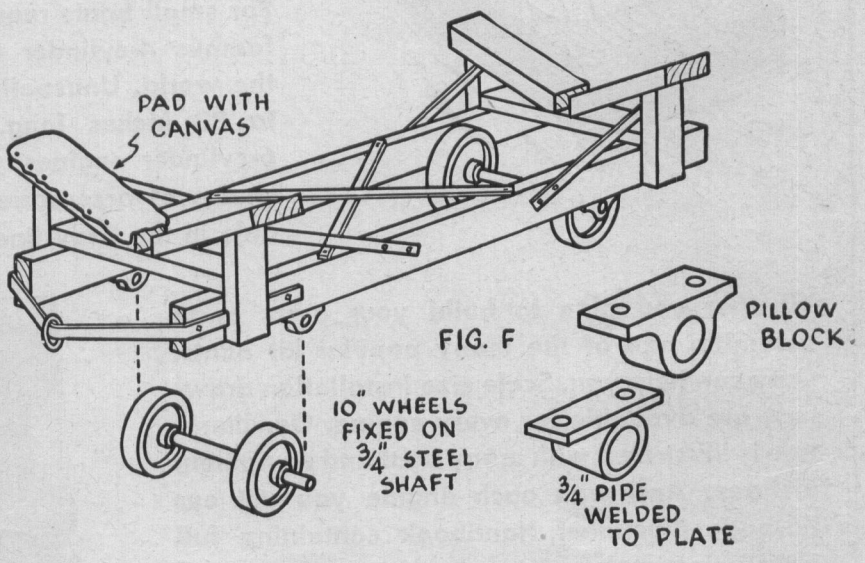


FIG. F

Fig. D shows the length of the car and it can be adapted to larger or smaller boats. Fig. F shows all of the details of the construction.

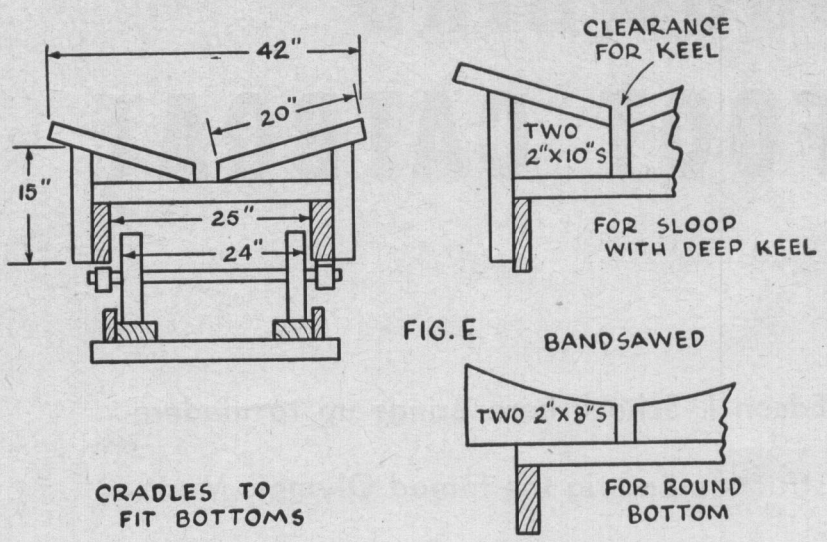


FIG. E

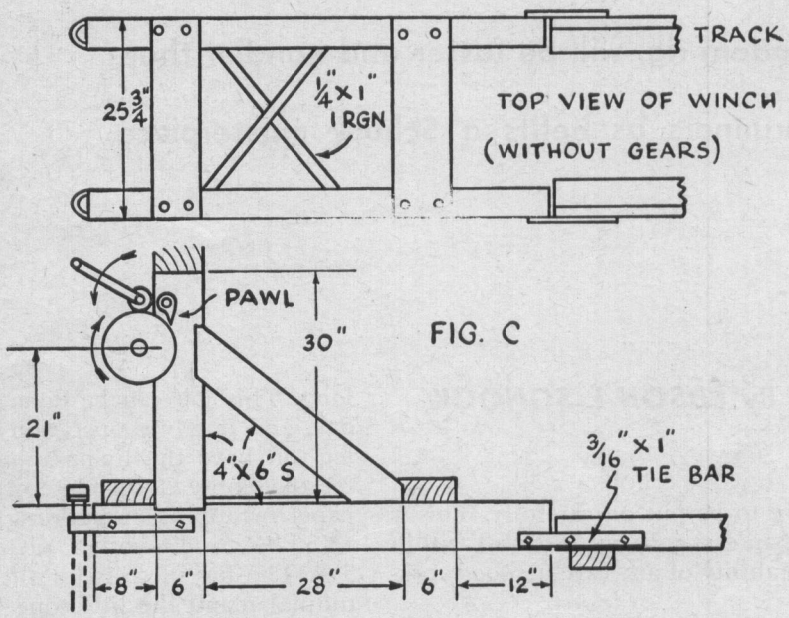


FIG. C

Fig. C shows the sturdy construction of the winch. At top, Fig. E, shows cradles to fit bottoms and also offers clearance for a keel.

SNOWBIRD
A 12-FOOT CATBOAT

Naval architect Edson I. Schock here brings up to modern standards of construction and rig the famed Olympic Monotype class which his father, Edson B. Schock, designed from the original California Snowbirds. This new Snowbird uses plywood, has a modern rig, will be faster and handier than either of her forerunners as befits a Schock masterpiece

By EDSON I. SCHOCK

THIS little cat is a modern version of the well-known Olympic Monotype class. This type of boat was selected by the Olympic Committee as a typical American small boat, and many of the original boats have been built both here and abroad.

In redesigning her especially for SPORTS AFIELD, I've modified the original lines of the boat only enough to make plywood planking possible, and the rig has been made a little more modern in style.

The boats built from this design should be lighter than the original boats were, and should sail a little faster.

Aside from putting on the bottom planks, the construction should be done easily by the amateur boatbuilder. The bottom planks have no twist in them, but the bend at the bow is fairly sharp, and they will have to be put on carefully. This is not an easy job, but it is well within the ability of any careful woodworker.

If you plan to make your own sails, *Sailmaking Simplified* by Gray will tell you all about it in the simplest terms. But most builders, by the time they get the boat completed are willing to let a professional make the sail.

This boat will make a fine racing class for any club, and an excellent boat in which to learn to sail.

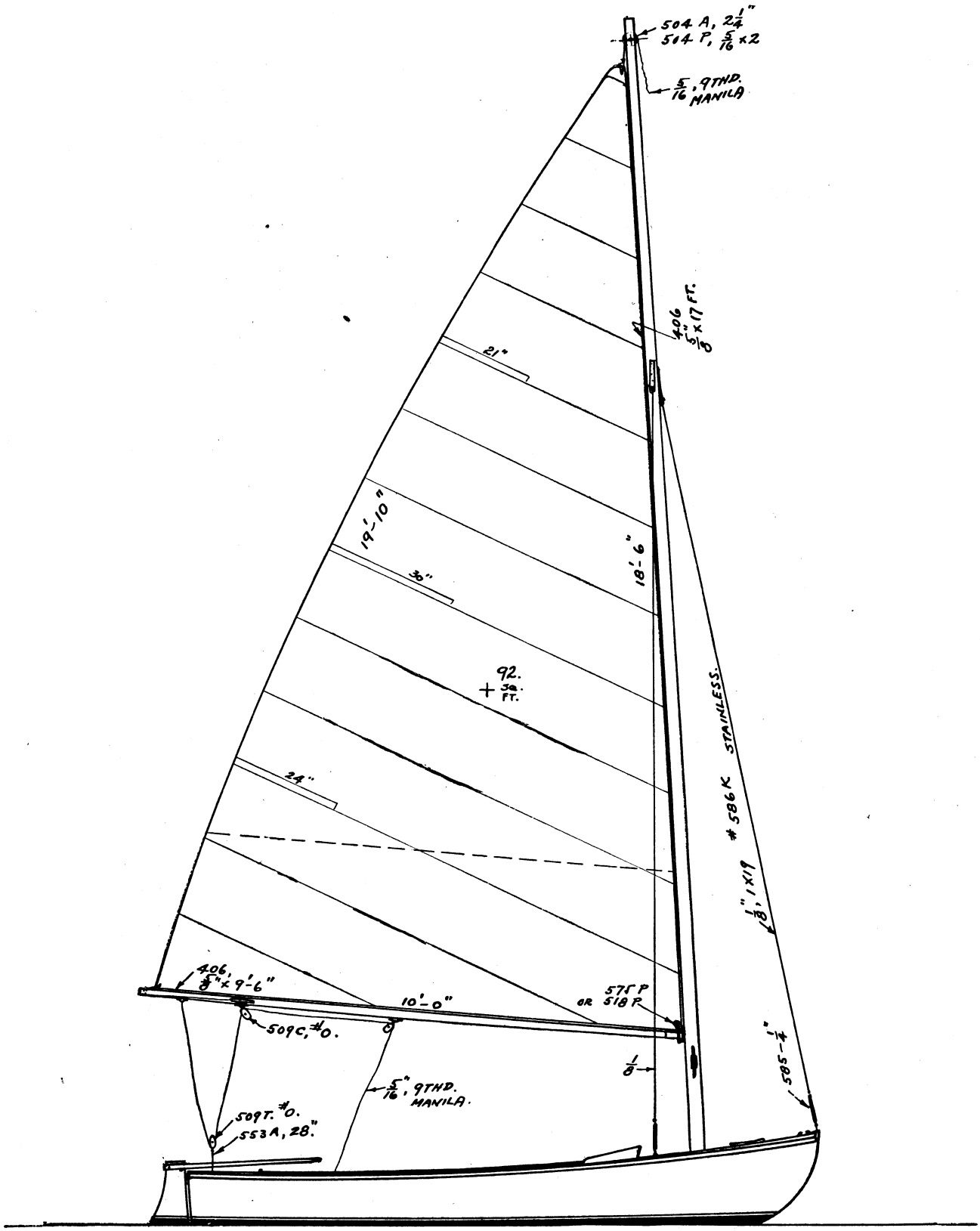
The first job in building this boat is to lay down the lines and some of the construction details full size.

You will need a floor space three or four feet wide by thirteen or more long. This job can be done in one day, and family cooperation should let you have the living room floor for that long. Get a piece of strong paper, wrapping or building paper, 32″x12½′, and another piece 24″x 5½′. The big piece is for the longitudinal plans, the little one for the sections.

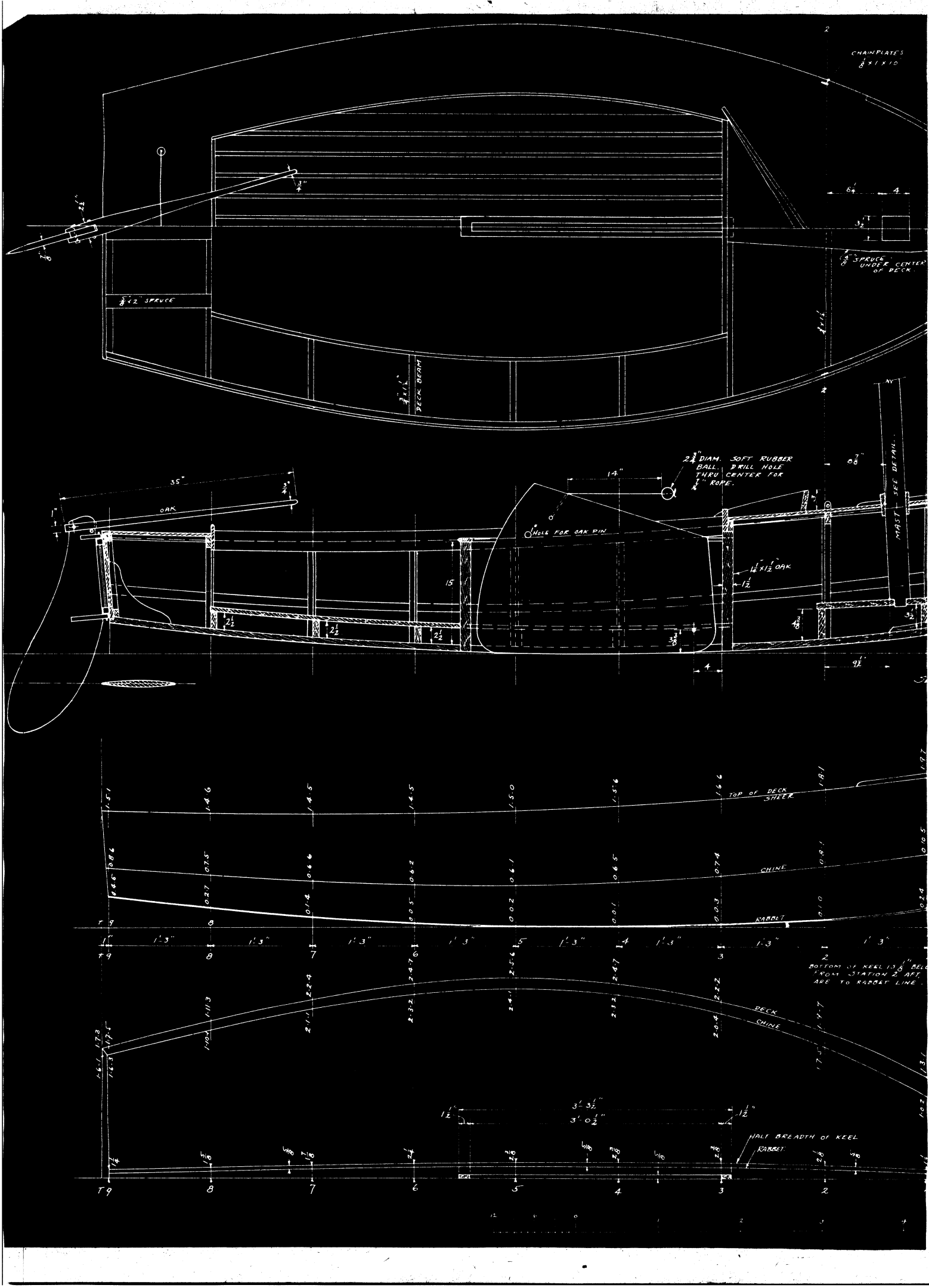
The *lines* of the boat give you necessary dimensions for copying on the paper the plan and elevation of the lines. These two drawings can be made one on top of the other, using two different color pencils, say black for elevation and red for plan view. Stick the big sheet to the floor with a few scraps of tape.

Draw the centerline on the edge of the paper. Or if the edge of the sheet is straight (stretch a string to check) you can use the edge as centerline. Measure along this line, starting at

HARDWARE FIG. NOS. ARE FROM MERRIMAN BROS. 185 AMORY ST. BOSTON 30 MASS. 1952 CATALOG.



NO. 129.
SAIL PLAN.
EDSON I. SCHOCK, KINGSTON, R.I.
SCALE ½" = 1'-0"


CHAIN PLATES
3/8 X 1 X 10
3/4" SPRUCE UNDER CENTER OF DECK
3/4 X 2" SPRUCE
3/4" X 1 1/2" DECK BEAM
MAST - SEE DETAIL
2 1/4" DIAM. SOFT RUBBER BALL. DRILL HOLE THRU CENTER FOR 1/4" ROPE.
35"
14"
OAK
HOLE FOR OAK PIN
1 1/4" X 1 1/2" OAK
TOP OF DECK SHEER
CHINE
RABBET
DECK
CHINE
HALF BREADTH OF KEEL
RABBET
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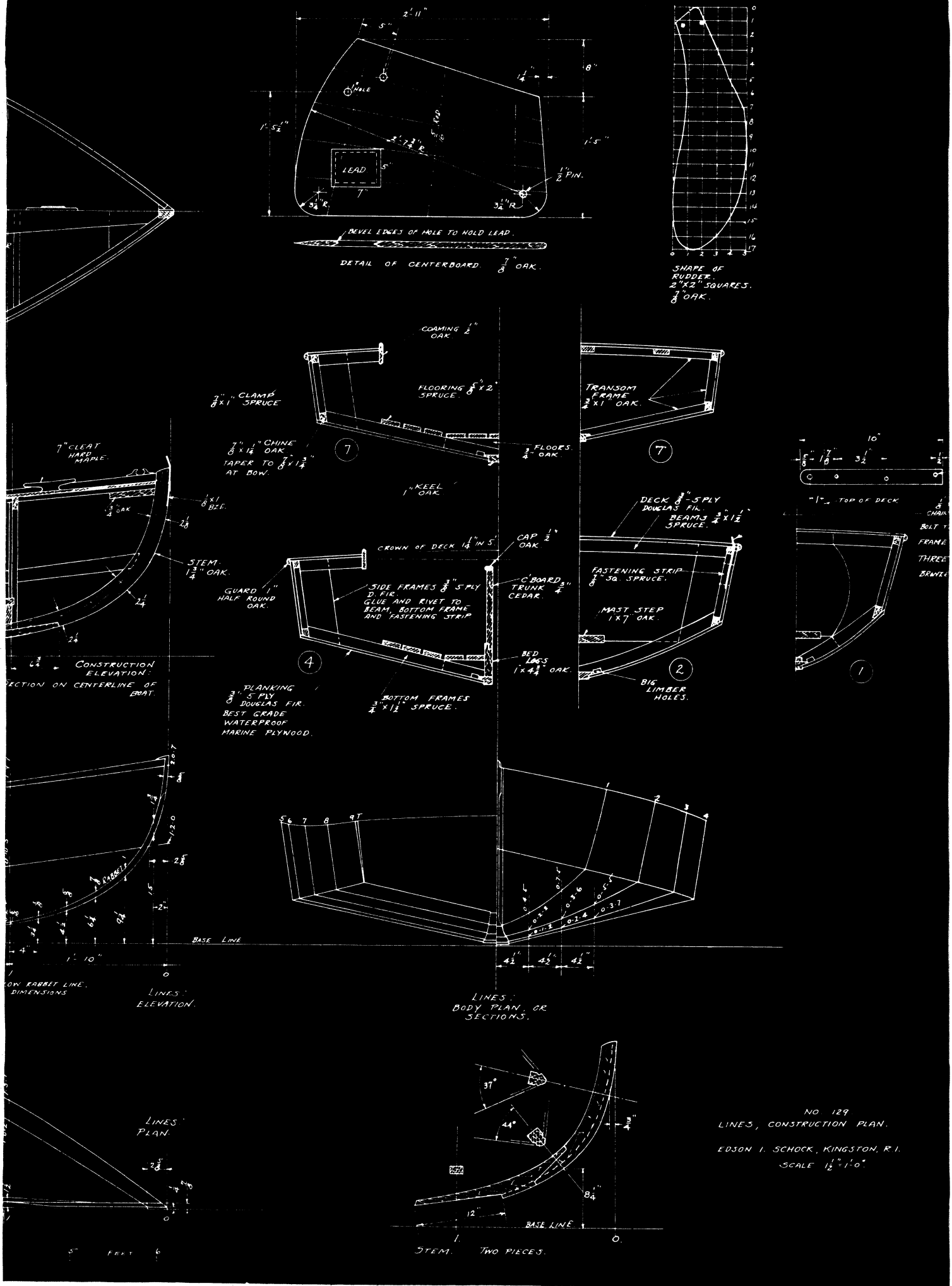


NO 129
LINES, CONSTRUCTION PLAN.

EDSON I. SCHOCK, KINGSTON, R.I.
SCALE 1/2" = 1'-0"

the stern, 1″ for the rake of the transom, then 8 spaces of 1′ 3″ each for the frame stations, then 1′ 10″ to the bow. Draw station lines across at each mark, square off the centerline.

The dimensions, called offsets, are given in feet, inches and eighths, thus: 2-4-1 means 2′ 4⅛″.

Lay out the points on each station line, showing the half breadth of keel, chine, and deck. The rabbet line is not needed yet. Connect these points with a smooth curve. For this a wood strip or batten about 5/16″x ⅝″, 14′ long is used. Such a batten is not easily come by, and you may spend some time hunting for a good straight piece with straight grain. White pine is the favorite wood for these. In drawing the lines hold the batten in place with weights of some kind—books, bits of junk, fingers (other people's fingers) or what have you.

The batten may not lie in a smooth curve. This may be due to inaccuracies in the offsets, or errors in copying them. The offset measurements are taken from a small scale drawing, and cannot be perfect, but they should not be more than ⅛″ off. If errors are found move the point, or a couple of points, to make the curve smooth and "fair." When these lines are fair, draw the rabbet line ⅝″ inside the keel half-breadth line from the stern to station 1, then ⅞″ off center as shown. This completes the plan view of the lines.

For drawing the elevation, use the bottom edge of the paper (if straight) as a baseline, and the *same* station lines. Draw the sheer, chine and rabbet lines, using a *new* color of pencil to contrast these lines with those already drawn in the plan view. Draw the bottom of keel line ⅛″ below rabbet line from stern to station 2, then fair it in to the stem profile shown. At station 2 the keel is ⅛″ below the rabbet line dimensioned on the drawing. From this point forward dimensions are given. For drawing the curve of the stem, a light oak batten is good, or a draftsman's celluloid spline.

Take up the big piece of drawing paper, and stick down the little one. Draw a baseline along close to the bottom, and a centerline at right angles to it right in the middle of the sheet.

To draw the sections, transfer the dimensions from the two big drawings just made, *do not use* the offsets. The lines on the full-size drawings have been faired, and should be more accurate than the dimensions on the plans.

As a sample, draw station 4, thus:

From the plan take the half breadth of the deck on station 4 and measure it out from the centerline about what you estimate the right height above the baseline. Make a mark. From the elevation transfer the correct height, thus locating this one point. For station 4 this will be 2′ 4⅞″ off-center and 1′ 5¾″ up from the base, if the offsets are correct. Locate the corner of the chine, and the rabbet line point. Connect these points with straight lines.

To transfer distances from one drawing to another, a strip of paper about 2½″ wide is handy. Mark the two points on the strip, then transfer the marks to the other view.

Draw *both* sides of the boat. You will need them later. Draw sections 1 to 4 one color, the rest a different color. This drawing will have a lot of lines on it when it is finished, and if it's all one color, it is just a muddle of lines.

When all sections are drawn, take off the plank. This process is simple. You draw a line *inside* of each section line, ⅜″ away, to represent the inside of the planking. This line is the line of the *outside* of the frame, without allowance for any bevel there may be. By placing the frames carefully we do not need to worry about the bevels, they are all undercut, so no allowance is needed.

Mark each station "outside of plank," "inside of plank" No. 4, etc. Mark or label *all* lines *as you draw them*. Saves time later. This completes the sections, or body plan.

Now put down the big sheet of paper again, and draw some of the important construction details on the construction elevation. The top of the keel may be shown, 1″ above the bottom of keel line. This makes a good line to measure from inside the boat. The centerboard trunk, and the board itself can be detailed on this drawing, as well as the stem. The advantage of drawing the details full-size is that the lumber can be laid down on the drawing and a glance will tell whether it is right or wrong. The more detail you put on the full-size plans, the easier it is to build the boat just like the plans.

Do not let people talk you into making changes. If you do not like this boat the way she is, don't build her. Select another design. But do not improve the design. Boatbuilders are very prone to change boats as they build them. And usually before the job is finished, they run into some difficulty they did not forsee, which would not have cropped up had they followed the plans. Almost everyone who sees your boat will suggest changes. Just say good idea, and go on building her as you started her. You will be better off.

NOW to really get started. The frames make an easy job to begin on, and present no problems. The aft frames are the simplest. Start with No. 8. The floor timber is 2½″ high and 15″ wide. Lay the stock on the body plan with the bottom of the piece on top of the keel. Mark the angles of the bottom on each side and cut to shape. Check back on drawing. Cut the bottom frame pieces, two alike, ¾″x1½″, a little too long. Then lay one on the frame drawing and mark the end bevels. Saw off. Make the other the same. Make the deck beams the same way.

The side frames are plywood, with a fastening strip along the outboard edge. Mark on the drawing and cut to shape. Notch corners for chine and clamp. Glue and screw (or rivet with copper rivets) the fastening strip to the plywood. This strip is to take the planking screws. Make one right-hand and one left-hand, and mark them P and S for port and starboard.

Watch yourself—it is easy to glue them up wrong, and that waterproof glue just won't come apart once it is set.

Let the glue stay quiet over night. Assemble the parts on the body plan drawing, each piece right on the line, and fasten them. Screw or rivet them together. The bevels on the edges of the frame can be planed on each piece as it is made, taking the bevels from the full-size drawings, or they can be done later after the frame is set up. Before assembly seems the easier, with a little final trimming later.

Notice that the frames in the after part of the boat are located so that the forward edge of the frame comes on the station line, while forward they are reversed. This simplifies bevelling.

Cut the notches for the timber holes. Drill a ¼″ hole through the floor timber vertically, in the center, for the bolt that fastens the floor to the keel. If you plan to fasten the

floors with long wood screws up through the keel this hole is not needed. This fastening is usually either a carriage bolt with washer and nut on the inside of boat, on top of the floor timber, or a long wood screw driven through the keel into the floor. Either method is good. Use 3″ No. 14 or No. 16 Everdur screws, or ¼″ Everdur bolts.

Paint the edges of the plywood pieces with plywood sealer. Give the whole frame a priming coat of white.

Where the frame and floor butt against the centerboard trunk the frame is made in two parts, and assembled against the trunk bed logs when the boat is set up.

The transom is similar to the frames in general make-up, and can be made along with them. The transom is pretty wide to get it out of one piece, so two or more boards will have to be doweled or splined together. Glue the joint. All around the edge of the transom fits a frame, glued and screwed to the transom. This takes planking screws. Make the edges of this frame extend beyond the transom a quarter of an inch or so, to allow for bevelling, on the sides and bottom.

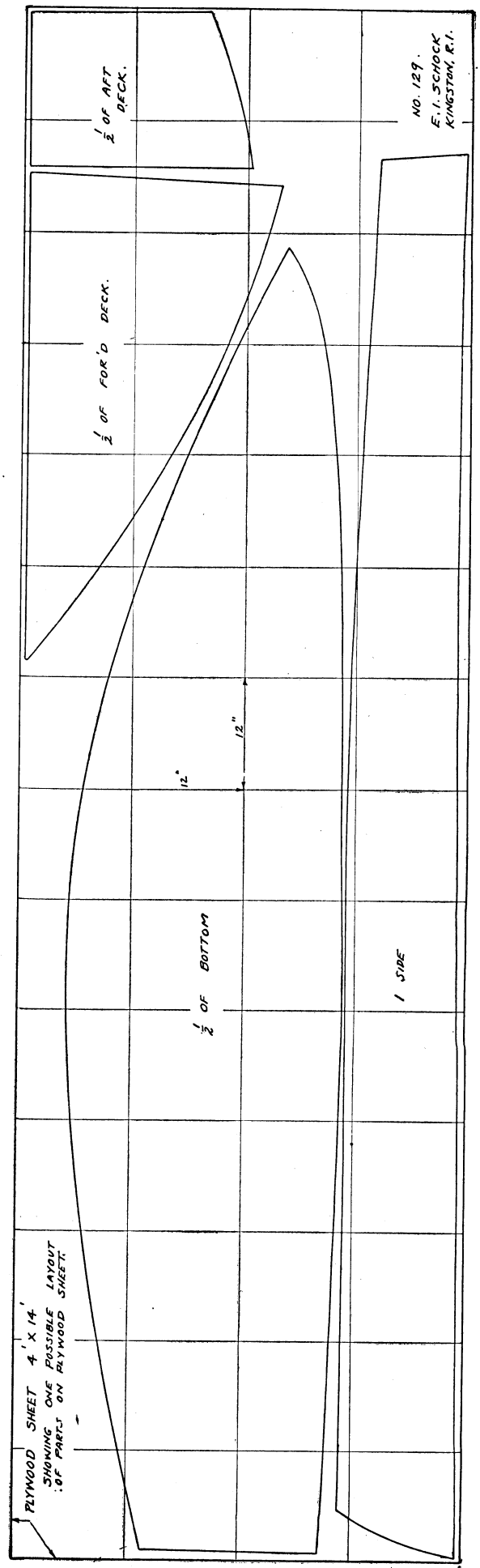
The transom frame is notched (or gained) for chine, clamp, and deck framing, but the transom is not. These pieces butt against the transom and are fastened to its frame.

Make the big knee that holds the transom to the keel. It should be oak or tamarack, a natural crook if you can get one. If not, use just a plain piece with the grain running diagonally. It will be fastened to the transom and keel with long wood screws.

Paint the transom and frame a priming coat.

Before setting up the frames, make the keel and stem. The keel is oak, white or yellow bark, 1″x4¾″ finished, 10′ 8″ long. Check these dimensions on your full-size drawing before cutting. Snap a chalkline down the center of the stock, and mark the stations on it. Due to the curve, the stations may be more than 1′ 3″ apart. Measure on the construction elevation.

At each station mark the half breadth, draw the outline with your batten, and saw to this line. Plane the edge smooth. With a marking gauge, draw the rabbet line ⅝″ from each edge. Some of the stock may be taken out for the rabbet on a circular saw, but since the angle



After your frame has been erected on the shop floor, you can make templates for the top-side and bottom panels which will lay out on the plywood about as shown here. The grid above is on 12″ squares and graphically depicts how little waste is involved in using the plywood. You'll need two 4′ x 14′ panels. Naturally you'll use the exterior-grade plywood.

varies the finishing will have to be done by hand. The correct bevels, or angles, appear on the body plan. Cut each station point to the right bevel, then fair between with a rabbet plane or hammer and chisel. Mark and saw out the centerboard slot. Shellac the keel to retard checking.

The stem should be made of a natural crook of tamarack or oak—if you can locate such a piece. These are scarce, and it may be necessary to make the stem of two pieces. In this case, the scarf will come wherever it best suits your stock. Bolt the pieces together with seam compound in the joint.

Cut out the pattern for the stem from your full-size drawing on the construction elevation, and lay it on the wood and trace around it. Saw out on a band or jig saw. This is 1¾" stock and the sawing should be done on a band saw to get the edges square. It can be done by hand, but is quite a job. Mark the rabbet line, and bevels, and cut to shape. This is all hand work. Shellac when finished.

The centerboard box should be bolted to the keel before the boat is set up, so make the box now.

The headledges are straight pieces of oak, 1¼"x1½". Measure the lengths on the construction elevation, and cut a little too long.

The bed logs are 1"x4¾" oak, with the bottom planed square and fitted to the curve of the keel, and the top edges rabbeted to take the sides of the box.

The sides are cedar, white pine, or cypress boards, splined or doweled together. Make all joints watertight.

The headledges and one side are assembled, then the inside surfaces painted before the other side is put on. Use copper paint from the bottom up 8", and whatever you like above that level. Put on at least four coats. The inside of the box is hard to paint after it is finished.

The headledges should extend below the bottom of the bed logs about 1½" to allow for cutting off flush after the box is fastened to the keel. The forward ledge should be long enough to form a post under the deck. They should be a tight fit in the slot in the keel, both sidewise and endwise. If you miss the fit, drive in little white pine wedges. Be careful you do not split the keel. Drill ½" hole in bed logs for hinge pin.

In assembling the keel and centerboard box, have a muslin gasket in the joint, set in white lead paste or seam compound. Screw the box bed logs to the keel with 3½" No. 16 Everdur flathead screws, leaving the heads flush with the bottom of the keel. The screws should be 4½" to 5" apart, staggered just a little to prevent splitting along the line of the grain of the keel or bed logs.

When assembled, put a couple of wedges in the slot in the keel and leave them there while you are building the boat. These are to check any tendency the slot may have to close up in the middle due to warping of the wood before the frames and planking are in place.

Now you set up the frames for planking. The usual procedure is to build the boat upside down. For this the frames may be set up on a floor, or on a backbone of a couple of 4 x 4's on strong horses. Whatever method you use have the keel about the right height above the floor for convenient working on the bottom.

WORK from a centerline with the stations marked on it, and set the frames, transom and stem square and plumb, using dimensions from your full-size drawings. Have everything braced well, because when you are fitting the plywood bottom and sides, you have to push in all directions on this framework. The frames which come opposite the centerboard box are not set up until the keel and box are in place.

Screw the big knee to the transom. Set the keel, with the centerboard box fastened to it, on the frames. Clamp it down, and bolt it to the stem. Screw it to the transom knee, and screw or bolt it to each floor timber. Drill for all screws, and soap the threads. The oak is so dense that you can twist a screw in two pieces if it drives too hard. Then it is quite a task to get the inner piece out.

Fit the chines. Fasten them to the transom, stem, and each frame. One screw per frame is enough. Plane the bottom edge of the chine so that it is fair with the bottom frames and forms a fair surface for the planking to rest on. This is an important watertight joint, so take your time. Fasten the chainplates to No. 2 frame. These must go on before the side planks.

The side planking can be put on next. The shape of these pieces is shown approximately on the layout of the plywood sheet, but do not rely on this for cutting. Make some kind of a pattern and fit it to the sides of the boat before you cut the expensive plywood.

Furniture dealers often have very large sheets of heavy cardboard which are used to protect mattresses or furniture, and they will give you these for the asking. They make good patterns for plywood parts. Fit the pattern to the frames, then mark and cut the plywood, allowing something for fitting and smoothing the edges—say about ⅛" all around.

Clamp the plywood in place, mark where to cut off a little, cut and try until it fits everywhere. Clamp and mark for screws, take off, drill for screws. Use ¾" No. 7 or 8 Everdur screws. *Do not countersink* for the heads, but pull the heads in flush when screwing them in. Use seam compound in the joint. Plane off the edge fair with the chine. Paint the plywood edge with sealer. Waterproof glue may be used instead of seam compound if you wish. It adds to the strength of the boat, and stays tight. The author has a 13' sailboat that is built this way. She is 11 years old, and the glued seams are still tight and strong. She has no leaks on glued seams.

Next come the bottom planks. Fit these the same way as the sides, using a pattern and the "cut and try" method of fitting. Screw them on, and finish the edges.

At the bow the bottom planks bend a bit hard. If you think they will break, very hot watersoaked towels or rags will relax them sufficiently to bend them without trouble. Fasten the bow end first, then work along towards the stern, keel side first, then chine. Screws are ¾" No. 7 or 8, at about 2½".

Paint plywood edges with sealer, and when dry put on a priming coat. Sand the planking and paint. If you are going to use copper paint on the bottom, put the copper right on the bare wood. No undercoat.

The hull should be ready to turn over. Let go the floor fastenings, and turn her over. Rest her on a couple of horses, making suitable braces to hold her upright.

The clamps should be put in now, if you did not put them in before you put on the side planks. Slide them down into the notches in the tops of the frames, and fasten with screws from the outside of the boat. An extra long screw can be put in at each frame.

Make and fit the mast step. If the floors are the correct height, the step will come at right angles to the mast itself, making it easy to fit the bottom of the mast to the step. Fasten the step to the floors. Do not step the mast on top of the keel, but make a step as shown. A mast stepped right on the keel makes a very concentrated load on the keel at that point, and has started leaks in a good many boats.

Flooring can be put in next. This requires no special instructions. Where the flooring rests on the floor timbers, the planks are straightedge. Where it rests on the frames, the edges will not be straight, and the amount of curve will have to be determined by trial, unless you know how to spile the planks.

The deck beams are already on the frames, so that part of the deck framing is done. Complete the framing under the deck, making it all as rigid as you can. It will not seem very strong until the deck is on.

Before the deck is put on, it is well to finish the inside painting, as it is a crawl-under job later.

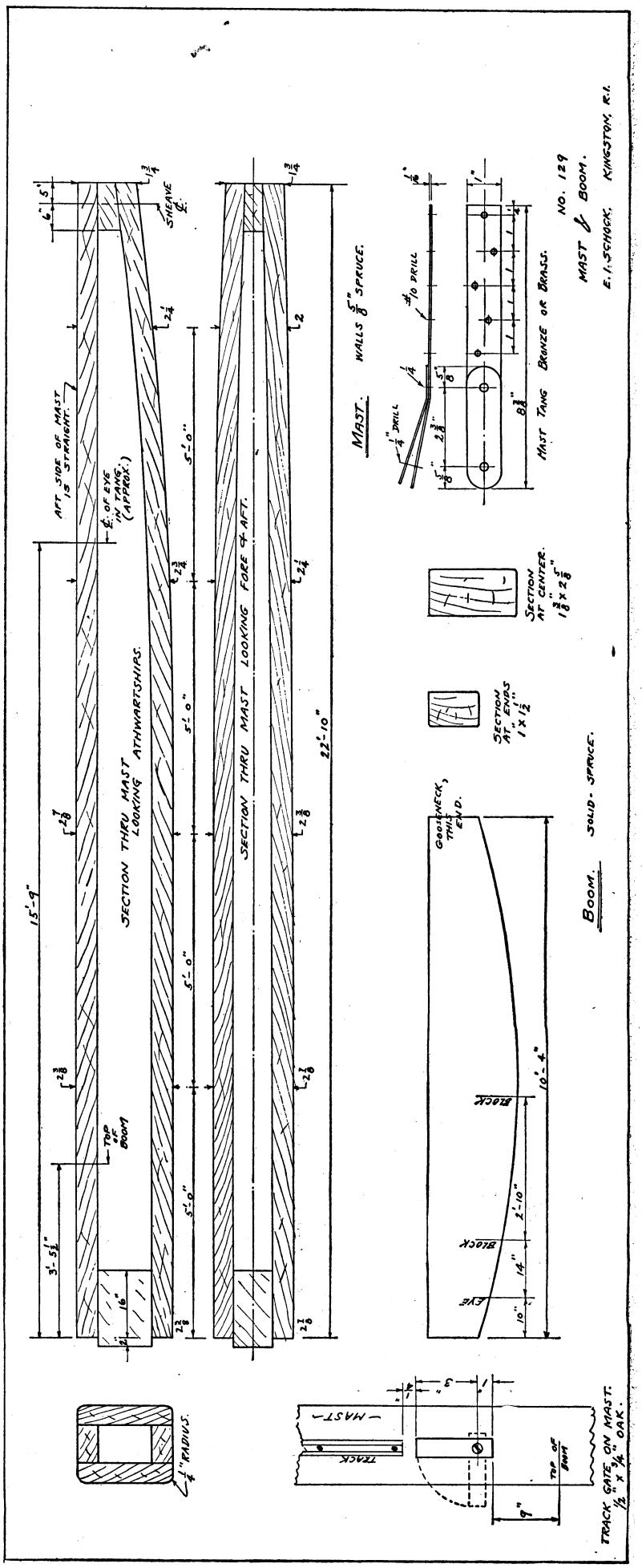
Fit the deck the same as you would the planking. Where a joint is necessary in the plywood put a butt-block under, well-fastened to each piece of decking. Spruce strips, ¾"x2½" will give you plenty of room for two rows of screws. Stagger the screws, and do not get them too close to the plywood edges. Glue the joints. The fitting around the chainplates has to be watertight, and a thread of cotton wicking and some seam compound should do the trick.

Make and fit the coamings and chockrail.

Screw on the guard strips around the sheer, and make a cap for the centerboard box. Do not cover the opening with this cap, but leave room for removing the board through the top of the box. Install deck hardware, such as cleats and chocks. The traveler shown is of Merriman wire rope.

The rudder can be cut from a single piece of ⅞" oak or hard pine (southern yellow pine). Streamline the aft edge, bottom and forward edge underwater to a nice thin section. Get rudder fittings that will not allow the rudder to float off if you touch bottom, but allow the easy removal of the rudder by properly authorized crew members.

The tiller is arranged to hinge at the aft end and rest on a pin in the



This plan of Snowbird's mast is drawn on a condensed scale, showing the hollow construction. This spar is of ⅝" rift sawed Sitka spruce, preferably glued only; 6 penny galvanized finishing nails may be used in lieu of clamps in assembly.

rudder head. Using a wire rope traveler, the tiller can be lifted to pass it over your head as you shift sides when sitting on the bottom of the boat.

The centerboard may be made of steel, bronze plate, or wood. Wood is cheapest, and in most respects the best. It should be made of seasoned oak or hard pine using narrow boards. Dowels or bronze rods hold the pieces together.

Lay out the shape of the pieces to fit your centerboard drawing on the full-size plans, and mark on both sides of each piece a line to represent the centerline of the rods holding it together. Drill each piece for these rods. Bronze or galvanized iron, 5/16″ diameter, threaded both ends will make these. The drilling can be done by hand or with a lathe or drill press or wood-boring machine. The machine methods are a lot easier and in most cases more accurate. It takes a good eye to drill or bore them by hand.

Glue the joints and clamp up with the through-rods. Keep the board flat. It will try to warp. Warping may be minimized by using good edge-grain stock, and reversing the grain in adjacent pieces. Looking at the end of the board, if one lift has grain sloping up to the right, have the next one show grain sloping up to the left. Also *narrow* pieces warp less than wide ones, and are easier to drill through.

The recess for the lead is bevelled all around so that the lead will be held in place without fastenings when poured. To pour the lead, make a sand floor big enough for the board to rest on. See that the sand fits tightly around the edges of the recess. Put heavy weights on the board to hold it down. Melt the lead and pour it into the recess, filling it a little above the top surface of the centerboard. Plane off smooth when cold. Lead planes easily and does not damage the plane.

Drill the holes for hinge pin, holdup pin, and pennant.

The underwater edges of the board should be streamlined to a thin edge.

When the board is up, the bottom six inches or so will be in the water, so paint this part with copper paint.

The mast is a box of ⅝″ straight-grain rift-sawed Sitka spruce. This is available at lumber yards that specialize in boat lumber in long lengths. It is expensive, but you buy only a very small amount.

Make the two wide pieces for the sides, and the two narrow ones for the front and back from the dimensions on the mast detail. Have the edges smooth and square. Make the fillers for the top and bottom.

To assemble the mast you need a level bench, flat and all one plane (not warped), 3″ wide or more, and 23′ long. Since you are not likely to have such a mast bench, one can be improvised of sawhorses and a 2 x 4 or 2 x 6, carefully set up. Or you can use the floor in the hall or living room provided you remember the mast is there and do not trip over it. And be *sure* there's a way to get it out. If you use any finished surface, cover it with newspapers to protect it from glue.

Boatbuilders use no metal fastenings in these masts. They glue the pieces together and clamp the whole assembly with a great many clamps. Few amateur builders have enough clamps for the job (about 65 are needed) so nails may be substituted. This produces a good mast although it may be a little heavier.

Use 6-penny galvanized finish nails, driven about 2 to 2½″ apart to hold the joint tight until the glue sets. Do not try to remove the nails.

To assemble the spar, set the fore and aft pieces, the thin ones, on the mast bench or floor, on edge, about the right distance apart. Mix up a good supply of waterproof glue, and invite all your friends who are handy with tools to come help spread glue. The more help the better. If the glue sets on one end of the long joint while you are spreading the other end you are in trouble. The more help you have the faster you cover all the surfaces.

BRUSH glue on the two top surfaces with stiff brushes like toothbrushes. Also put glue on the part of the side piece that forms the joint. Lay the top (side of mast) on the pieces on the bench like the lid of a box and nail from the butt end towards the top. Have a helper sight along to see that you are keeping the mast straight along the aft edge. A chalkline or other guide on the bench will help to keep the mast straight. Keep the edges flush. The glue will make the pieces slippery. A wet towel handy will keep your fingers from becoming completely glued together.

When all nailed turn the box over, put in the end filler blocks; spread glue on the other edges and other side piece; glue and nail the opposite side into place.

As anyone can see, the difficulty in using this method is that the mast is not clamped rigid at any time, and it can easily be glued up curved instead of straight. The final result, however, is not bad if you are careful.

As soon as the nailing is all done, rest the mast on the bench with the back side down, and clamp it there in a straight line using a tight string for a centerline to check it for straightness. Weights will have to be used for clamps if you are working on a floor.

The boom is simply a rectangular section spar, straight on top and tapered towards the ends on the bottom and sides. Any smooth curve will do for the bottom. Spruce is probably the best material, but West Coast cedar makes a nice light boom, and looks well when varnished.

To rig the boat, have the stay and shroud assemblies made by Merriman Brothers Co. or someone else who does that kind of work. The headstay is 14′ 3″ long including the turnbuckle, and the shrouds are each 14′ 9″, including the turnbuckles. Before you fasten the tangs to the mast, clamp them in place and put the mast in the boat. Try the shrouds and headstay length, and note how much, too long or short, they are.

Re-clamp them in the right place, and try again. If all is well fasten them. To make the tang fastening as strong as the wire stay will require one ¼″ bolt through the mast, and five No. 10 roundhead wood screws into the mast wall—¾″ No. 10 roundhead Everdur screws will be suitable. Stagger the screws so they do not come in line along the grain of the wood, as shown on the tang detail.

Cut the mortise in the masthead for the halyard sheave, and drill for the pin. Put on the cleat and gooseneck. The track should have a little stop of some kind to keep the slides from coming off the top, and a gate at the bottom. This can be simply a piece of oak about ½″x¾″, 4″ long with a hole in one end for a screw. Swing it up to keep the slides on, and crosswise to take them off.

Put on the boom hardware—track, gooseneck, outhaul and blocks.

With a final painting and a last check-up for fittings, she should be finished.

YO HO!—Plywood Cartopper

By WESTON FARMER

Designed with easy bends in her planking this boat is light enough to be tossed atop your car. Cheap, too

YO HO! is not the best looking boat I have lifted from my drawing board these past 35 years—not by a long shot. But she very successfully incorporates extreme ease of building with very nice water feel.

As my good old friend Billy Atkin, dean of American motorboat designers, says, "A good small boat is harder to design than a good large boat." So I am happy to relate that an unusually good compromise has been doped out in *Yo Ho!*

She has enough rocker to row reasonably well, yet not enough to kill her for planing work. She will putzz along with a 1½ hp Elgin kicker at 7 miles; can use the Evinrude angle shaft 3 hp motor, and even take 7½ hp Champions, Johnsons, Scott-Atwaters or Mercuries. A *Yo Ho!* was built—see photos—and the lessons learned are here incorporated for the final release as a perfected design.

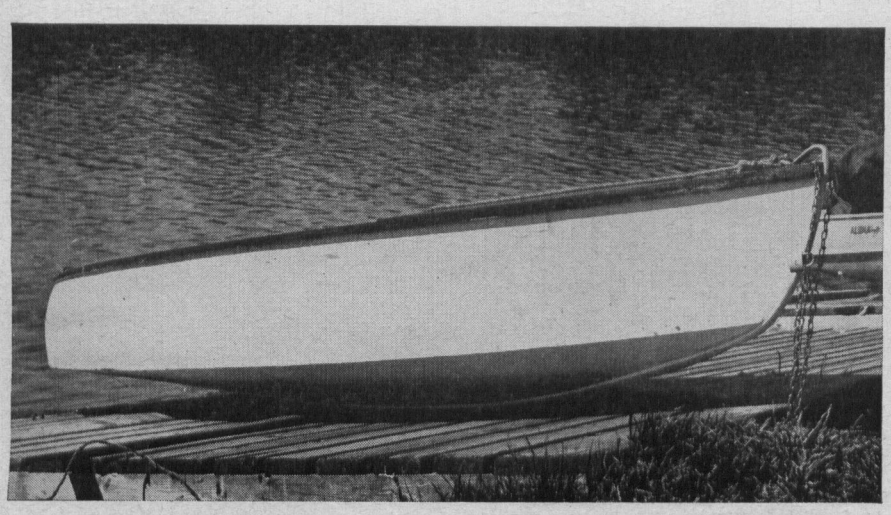
A boat for ideal cartop carrying should come within the limits set by the usual 52″ car carrier spreaders, and should be reasonably flat in sheer to accommodate wide variation in car crowns.

The *Yo Ho!* experimental model, preliminary to this design, was 12′ long by 48″ beam, 16″ depth. While her water performance fitted the outlined requirements, I felt that her rocker could be flattened a little without interfering with good rowing, that her dead rise could be increased to give a boatier feel, and that a pram type bow with a rounded block stem would take less bending. So our published and final version of *Yo Ho!* is one foot longer—13 ft.; her beam is 50″ over the sheer guard; and her depth has been increased to 18″. This accounts for the slight difference in modeling between the photo version and the design here. Another difference incorporated was to put the steering wheel on center. This gimmick is useful with 5 hp and over. So is a little water speedometer, shown on the dash.

She is simplicity itself to build. There is no sny in any of her planks —no twisting bends, in landlubber language—to baffle the neophyte constructor. Anybody who can run a saw, use a plane, and drive screws can do about as good a job as a professional boatbuilder.

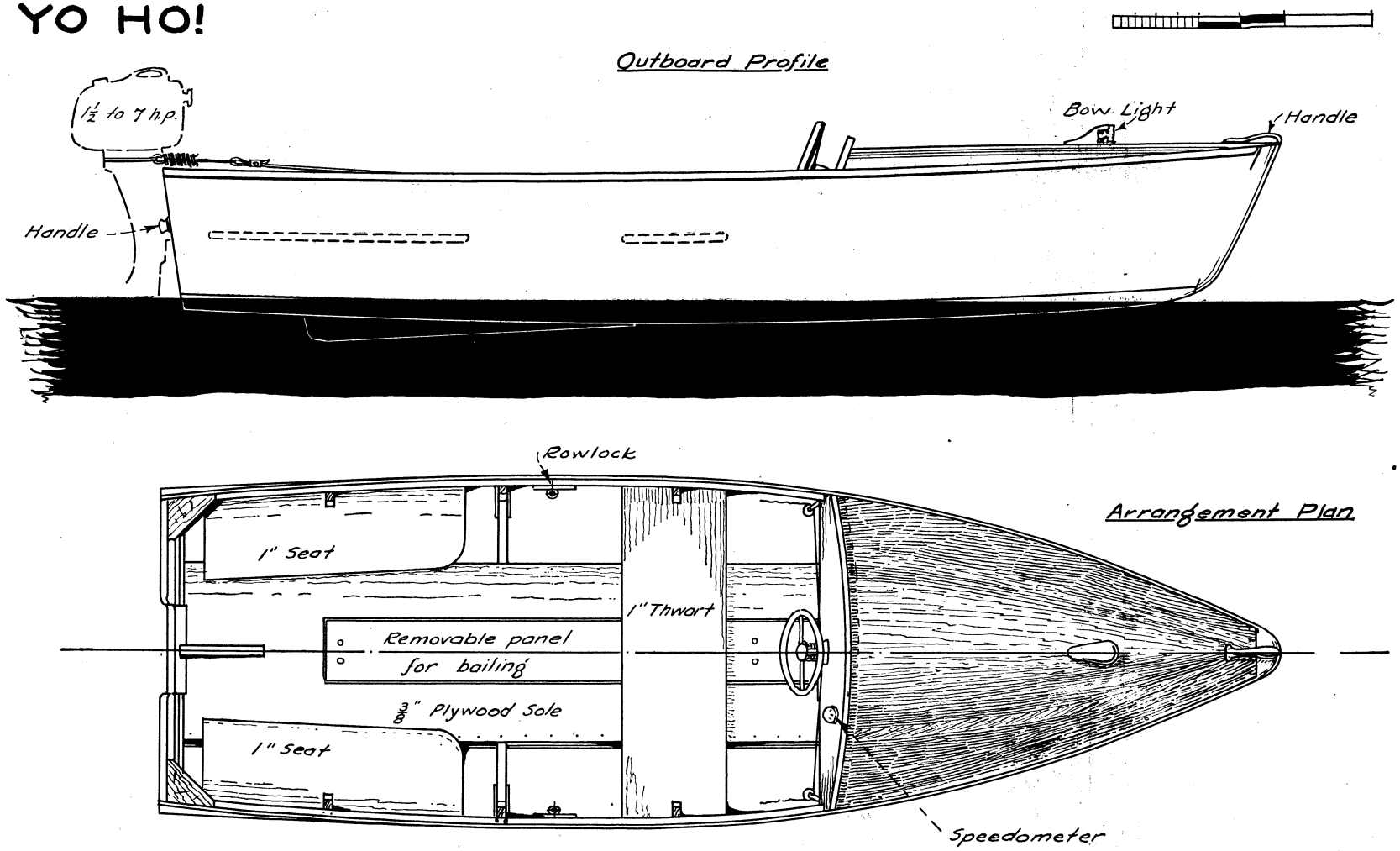
To get these features, we have innovated a bit. Trouble with nearly all plywood designs is that when you have seen one, you've seen them all, constructionwise. But the modeled block schnozzle on *Yo Ho!* though not new, is seldom seen these days. And the canted frame forward put in thus to dodge bevelling that frame, is a new idea, and a very good one. It lets the screws go flat to the face of the plywood planking, and square into the frame. Thus, there is no need of "aiming" the screw from outside, hoping you'll end up with most of said screw somewhere in the frame.

Yo Ho! is planked with ¼″ plywood topsides, and ⅜″ plywood bottom. All plywood, of course, to be

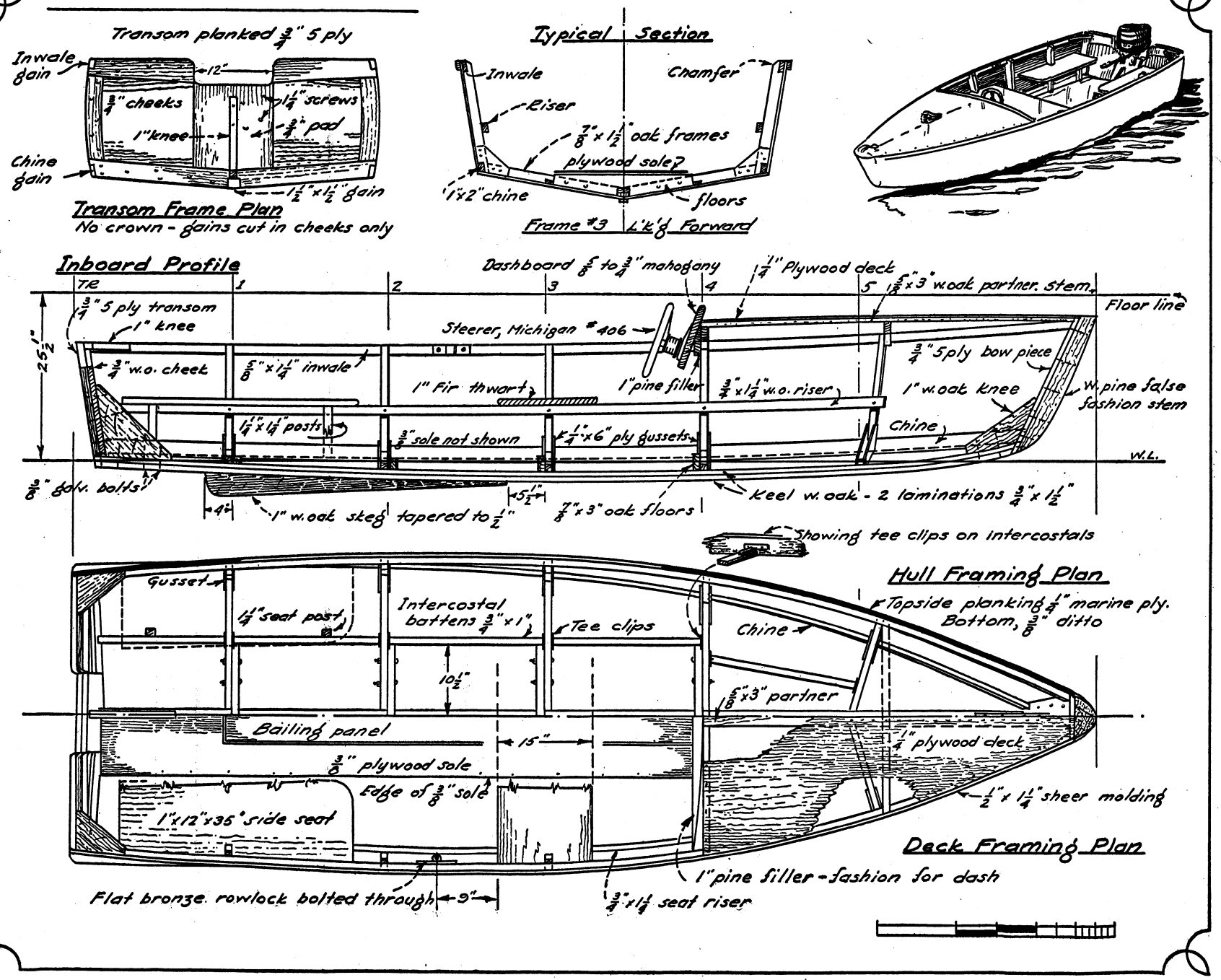


Yo Ho!'s parent design was this boat. As shown in the drawings, the final design had her bow piece changed and less dead rise forward. After testing this hull, designer Westy Farmer then made the final drawings that accompany article.

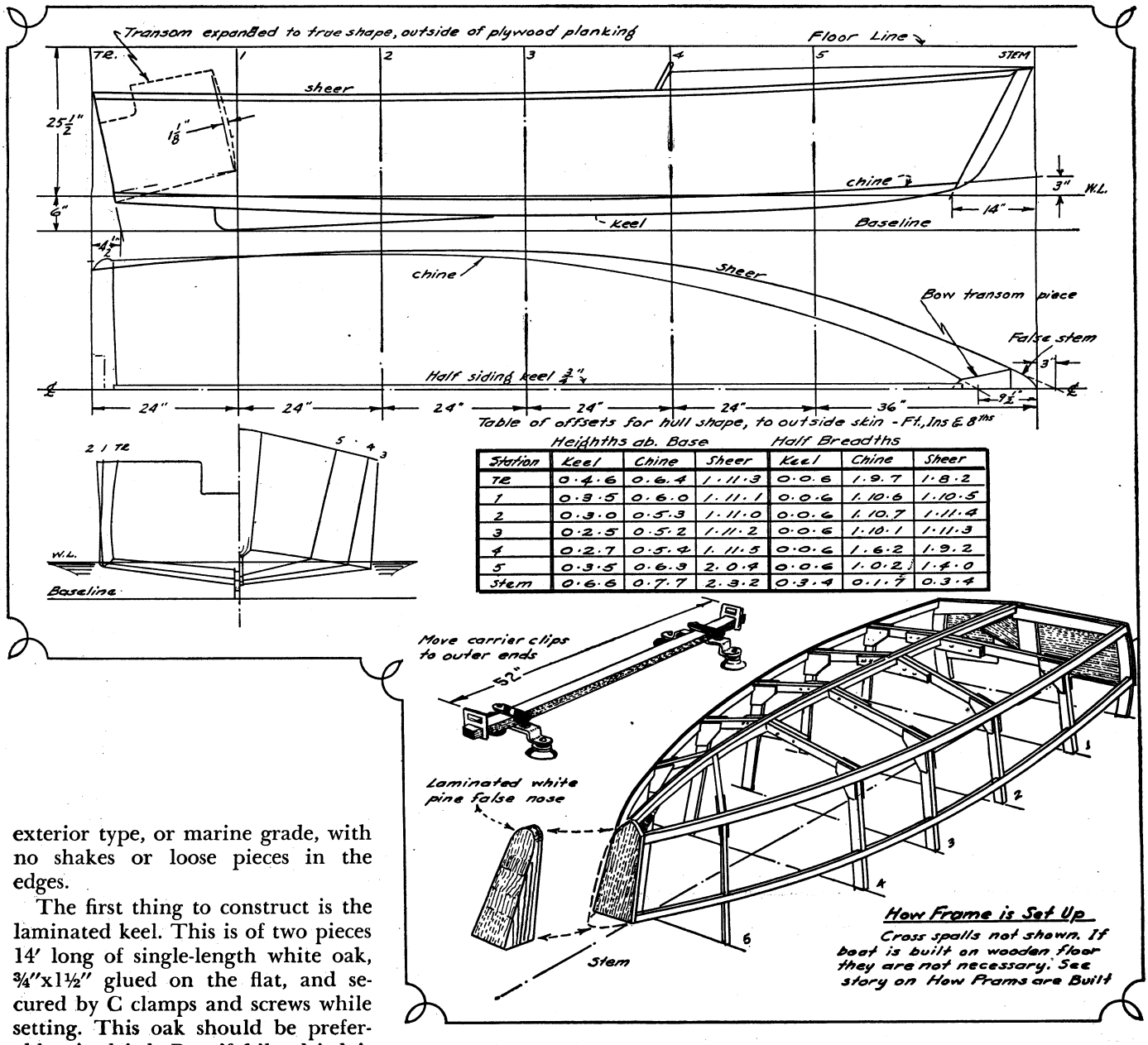
YO HO!



Here is Yo Ho! Her outboard profile suggests a skiff, but she has enough dead rise to throw water aside under the urge of motors up to 7½ hp. Deck hardware and suggested steering cable hook-up are shown. The bow and transom handles will be a great aid to handling the lift to the top of your car. For fishing the seat arrangement has worked out very well, and the removable panel for bailing will be blessed by those who know what score is.



Her designer lays no claims for good looks in Yo Ho! but she is a practical boat for the beginner. Here shown are all the constructional details one must have to complete the hull. Note that the intercostal battens are installed after the hull is built, being held to the frames by Tee clips. The construction of the fashion piece which forms the stem is depicted. This false stem is screw fastened through the bow transom piece and forms a hood for planking, and added protection.



Station	Keel	Chine	Sheer	Keel	Chine	Sheer
TR	0·4·6	0·6·4	1·11·3	0·0·6	1·9·7	1·8·2
1	0·3·5	0·6·0	1·11·1	0·0·6	1·10·6	1·10·5
2	0·3·0	0·5·3	1·11·0	0·0·6	1·10·7	1·11·4
3	0·2·5	0·5·2	1·11·2	0·0·6	1·10·1	1·11·3
4	0·2·7	0·5·4	1·11·5	0·0·6	1·6·2	1·9·2
5	0·3·5	0·6·3	2·0·4	0·0·6	1·0·2	1·4·0
Stem	0·6·6	0·7·7	2·3·2	0·3·4	0·1·7	0·3·4

The lines drawing is duplicated full size from the measurements in the offset table. The frame setup is clearly drawn. See note, lower right.

exterior type, or marine grade, with no shakes or loose pieces in the edges.

The first thing to construct is the laminated keel. This is of two pieces 14′ long of single-length white oak, ¾″x1½″ glued on the flat, and secured by C clamps and screws while setting. This oak should be preferably air dried. But if kiln dried is all you can get, see that it is clear—no knots. And then, before running it through the planer to size it, put it outdoors in the grass for a couple of nights, returning it to shelter out of the sun daytimes. In a couple of days the dew will have restored enough cellular water to make the oak about the equal of air dried stuff, which is tougher, bends easier, doesn't check as much.

See that there is about 3″ of overbend in the keel as glued up. It will unbend easily, but trying to get more into it, once set, will be hard.

Then, *lay down the lines full size.* No boatbuilder needs to be told why to do this. Yet the amateur always wants to get right to making the frames, thinking that if he follows the printed dimensions, he'll be in the Promised Land.

But confidentially, it just ain't so.

You lay down the lines to correct any errors in scaling the naval architect makes, but more important, you do this laying down to provide yourself with a faired, dovetailed master chart showing the trail-in of all bevels, the size and position of frame gussets and the like. These are all details that take perhaps a half day's time in a boat this size, and will possibly save a week in building.

The lines as drawn to the offsets are to the *outside* of the skin, and planking thickness must be subtracted in the amount of ¼″ for the topsides and ⅜″ for the bottom. The procedure is exactly as outlined in the story *How Prams are Built* elsewhere in this issue. As a matter of reference, since *Yo Ho!* is a pram with a fine pram bow, extended to a bulbous bow by the false piece on her nose, the procedure of building *Yo Ho!* is exactly like the little pram I just mentioned. The only difference of construction will be that the frames stay in *Yo Ho!*, and that slightly longer screws will be used through the bottom: 1″ No. 6 screws on 2½″ centers through the

⅜″ bottom planking instead of ¾″ screws as in the pram.

Otherwise all screw specifications are the same for *Yo Ho!* as for the pram. See Figs. 11, 12 and 13 in the pram story. For those too lazy to turn the pages, I have also drawn a framing setup with the lines plan here which will depict the essential differences.

The secrets of a good plywood boat are two: a heavy strong frame, and good bevels set in elastic seam compound, such as Kuhl's, obtainable at all marine hardware stores. The frame of *Yo Ho!* as you may note from a perusal of the drawings, consists of the following members:

Keel, laminated, two pieces ¾″x 1½″x14′.

Chines, one piece single length 1″x2″ mahogany. The secret of a good chine in a plywood boat is one of good dimension, preferably a good fastener holder, like mahogany, and one which will swell. I know oak is used a lot, and there is nothing better for holding power. But oak doesn't swell much, and it takes very sharp tools to get fair faying surfaces.

Frames are of white oak, ⅞″x1½″, gusseted at the chine by a piece of ¼″ plywood at each side of the frame, glued, screwed and preferably filled with a block across the diagonal of the gusset.

The transoms, both bow and stern, are of ¾″ 5-ply plywood. The cheek pieces are of ¾″x2½″ white oak, glued and screwed. The floors, the members which tie the keel ends of the frames together, are of ⅞″x3″ oak, wide enough to accommodate the width of the cockpit sole. The sole rests on these floors.

Bolt the frames and floors with two ¼″x2″ galvanized carriage bolts each side of the keel. The floor is gained out to go over the keel. *Don't cut the keel.* Two small galvanized finishing nails driven from the frame heel into the keel while the boat is bottom up and being framed, will locate and hold the frame to the keel while planking. A long screw from the floor into the keel holds the floor.

Along the edge of the cockpit sole, battens are put in *between* frames after planking. They are held at each end to the frame by a standard tee clip about ½″ on the face, and screwed to the frame and batten. Of course there is no law against half-gaining the battens through the frame, but I wouldn't. It weakens the frame. The object of the battens is to prevent panting, and consequent working of screws.

There is a ¾″x3″ white oak partner running along center on the deck, and to this the plywood decking may be jointed. It is screw-fastened with ¾″ No. 6 screws spaced about as depicted.

The false stem is a fashion piece made of white pine in laminations. These laminates may be glued with Cascophen or other good glue, held temporarily by brads as the sandwich is made up, but see to it that the nail ends won't be near a cutting edge of your plane or draw knife when you shape the thing up. This fashion piece is glued and screwed to the bow transom, driving the screws into the pine piece from inboard outward.

The skeg is dimensioned as shown, and is very necessary if you're doing any rowing while you fish. If you just want a cartop speed pot, leave it off.

The knees, inwales, seat risers, thwart and seats are all clearly drawn, and need nothing but reference to the drawings to enable any craftsman to understand them.

The sole is of ⅜″ plywood, and as shown has a removable panel, the better to bail from. Too many of the kits on the market are never thoroughly tried out by their perpetrators. And getting a boat dry under a fixed sole flat can never be done. We've got that fixed here!

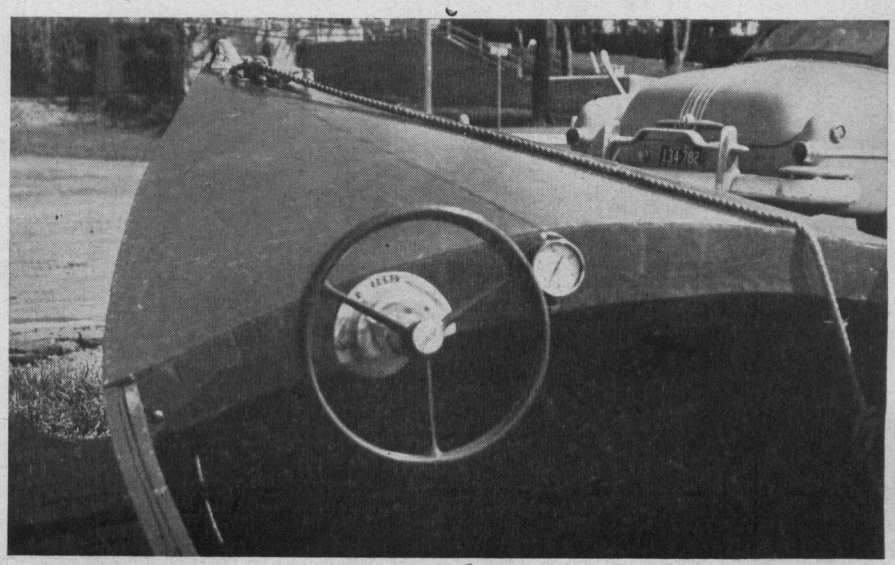
Prime the plywood with Firzite—about two coats—before applying the best marine finish obtainable. I would paint the interior green, the outboard portions white, and leave the sheer guards, the thwart and seats bright varnished. This is yacht-like and Bristol fashion.

Yo Ho! will weigh something in excess of 100 pounds, depending upon how neat to dimension you have worked. This makes easy cartop stowage. In that department she is fine. But do not expect too much of a little boat like this. On a boat you tote on top of an auto, you can't get everything. If it is out and out speed and planing qualities you want, build something like *Scram Pram,* which appeared in the 1953 SPORTS AFIELD BOATBUILDING ANNUAL, a few copies of which are still available. But if you understand boats, and know what a good little rowing boat can be, and use horse sense in conjunction with a motor, you'll find her delightful. She will not trim exactly as shown in the outboard profile, as the motor was drawn in after the initial drawing was made. But she will float to that line when first launched, and you'll know enough to trim her so she rides well.

As to cost, $40 will buy everything, I am sure, unless larceny has set into the hearts of the local pirates. Boats are funny—you can spend twice as much on one identical twin, and few people can tell the difference when the jobs are done.

Drop me a line if she turns out well, will you?

Originally installed off center, the steering wheel was found to be unworkable, so in final plans the wheel has been centered and the speedometer, useful gadget on sale at marine stores, is placed offside.



BUILD THIS SAILING SURFBOARD

Planing along close to the water on this sailing surfboard will give you the thrill of a lifetime

By HI SIBLEY

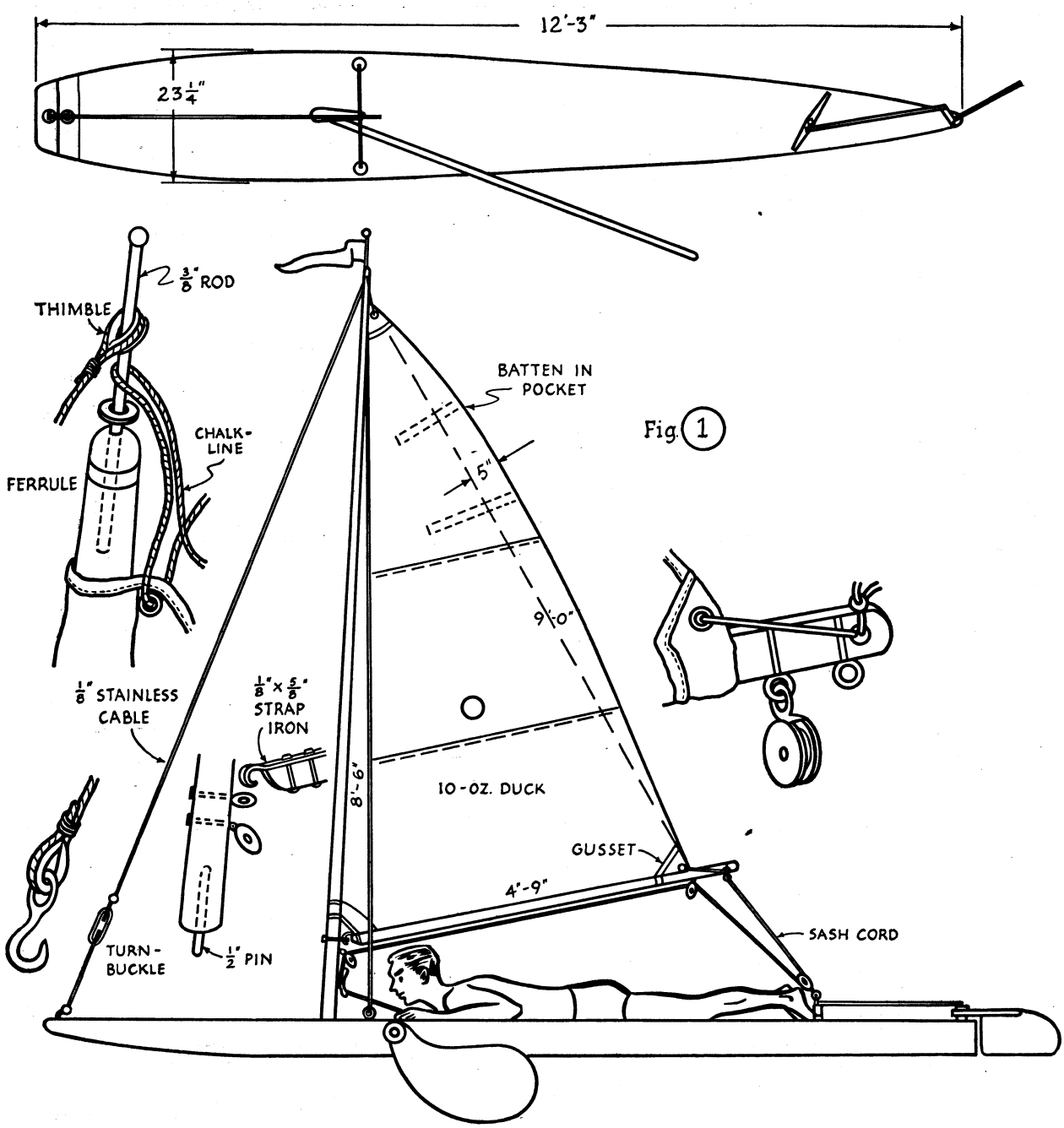


Fig. 1

HERE is a board that you can use for both surf riding and sailing. When the mast and rudder unit are removed the deck is absolutely clean.

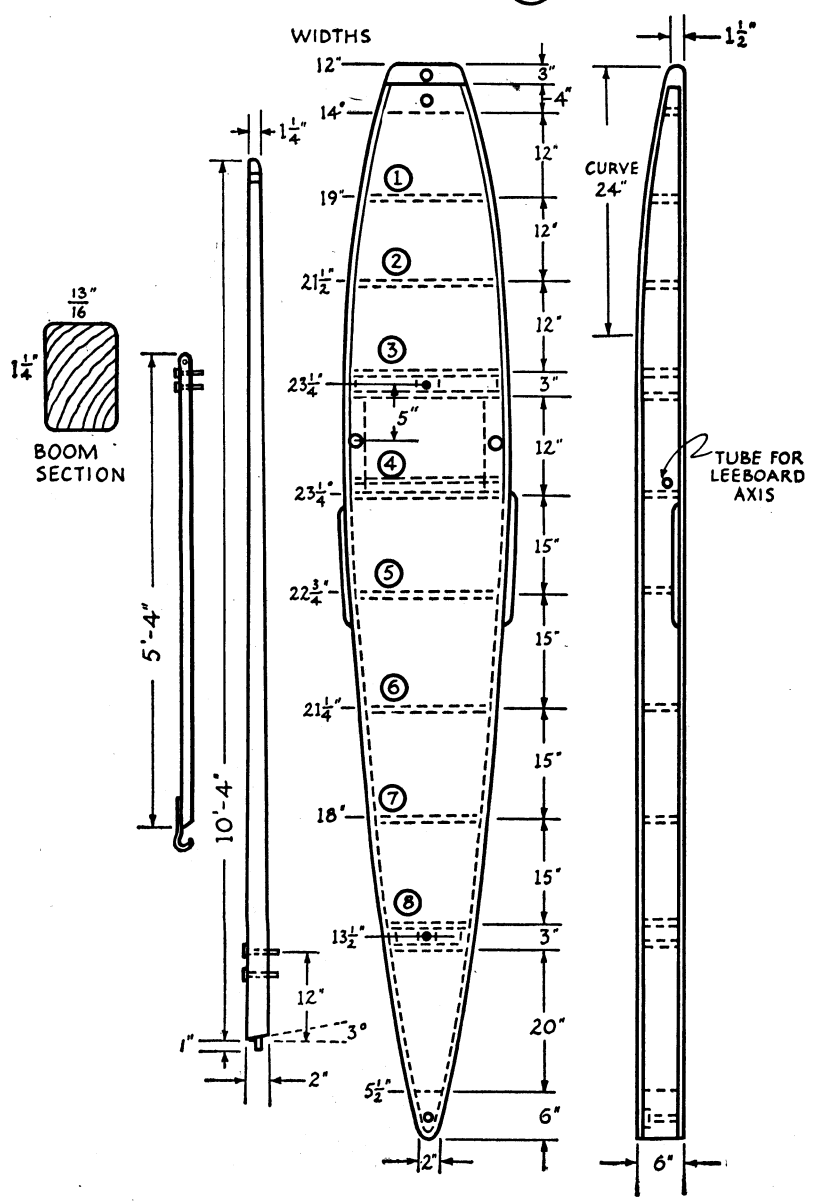
To remove the sailing gear is a matter of minutes. Just loosen the turnbuckle on the forestay, lift out the hook, tilt the mast back slightly, and take up the two side hooks. Next unscrew the bolt which serves as a pivot for the steering bar, and also the rudder post. A pin through the hub of one leeboard permits withdrawing the tube serving as pivot. All the gear can be stowed in small space.

Even with leeboards and rudder in place, you can slide the board up on the beach without damage, as in the profile view, Fig. 1. Here also is the deck plan and dimensions of the sail. The sail is drawn taut by cords through grommets at peak and foot. Mast and boom slip into wide hems in the canvas.

Dimensions between bulkheads and widths at each station are given in Fig. 2, together with mast and boom.

Dimensions for laying out the hull of Hi Sibley's surfboard design. It will be best to lay this down full size. The thwartship dimensions as well as bulkhead frame spacings are given. Board is planked with plywood.

Fig. 2



Both mast and boom should preferably be of straight-grained spruce. But if that's not available, use pine or fir.

First make the noseblock, Fig. 3. This is shaped from a single white pine block, or from two or three pieces glued together with grain running fore-and-aft. Bore for forward eye bolt and drain pipe. This pipe has a small hole in cap to equalize air pressure. Make tailblock next, as in Fig. 4.

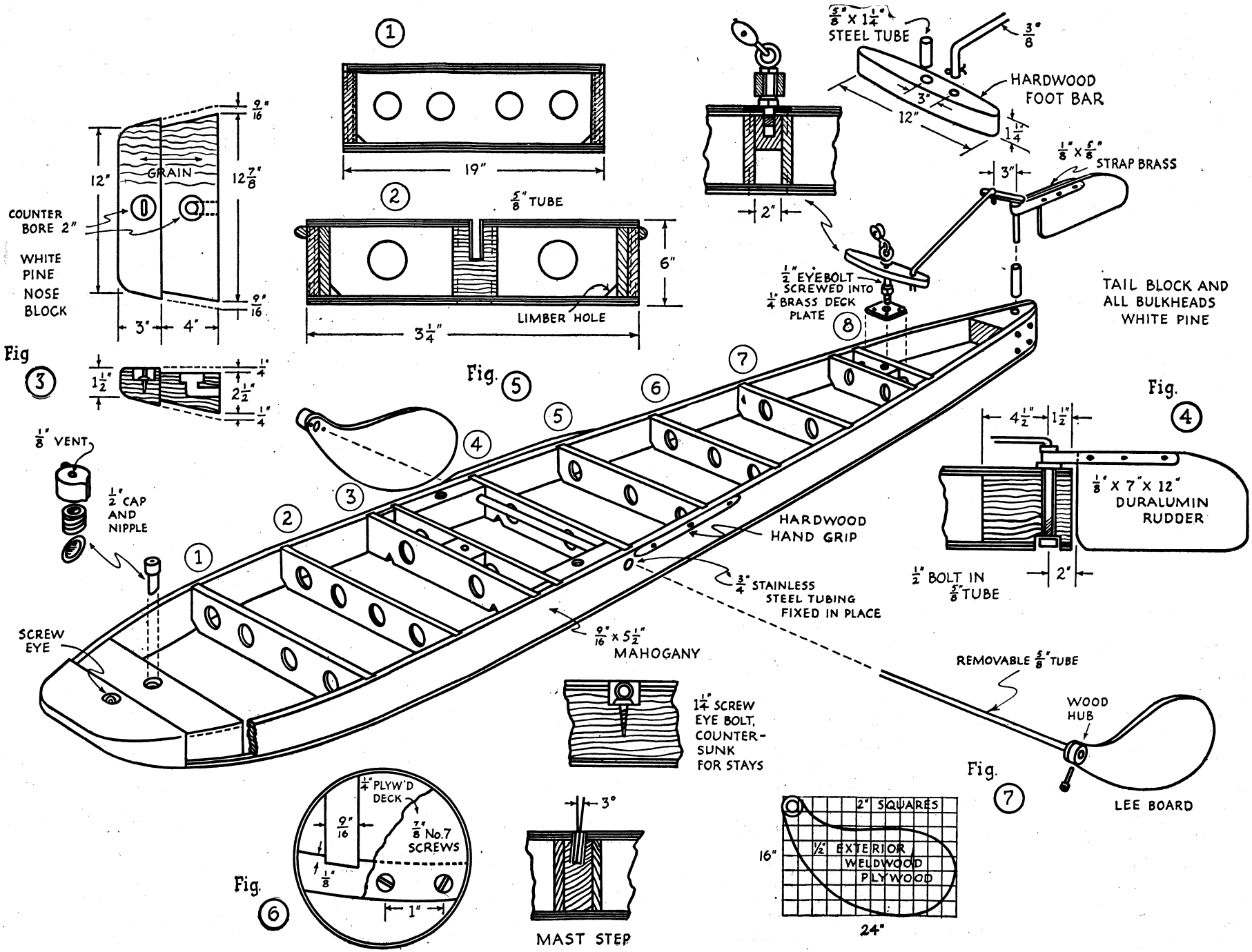
Now lay out the deck outlines on a panel of exterior or marine grade plywood, ¼"x2'x12'. Mark the widths at the several stations, and trace the curve with a straight-grained spruce or fir batten ¾"x¾"x146". This will insure a natural curve and may vary slightly from the dimensions given. Saw along the traced lines, allowing 1/16" or so for trimming later.

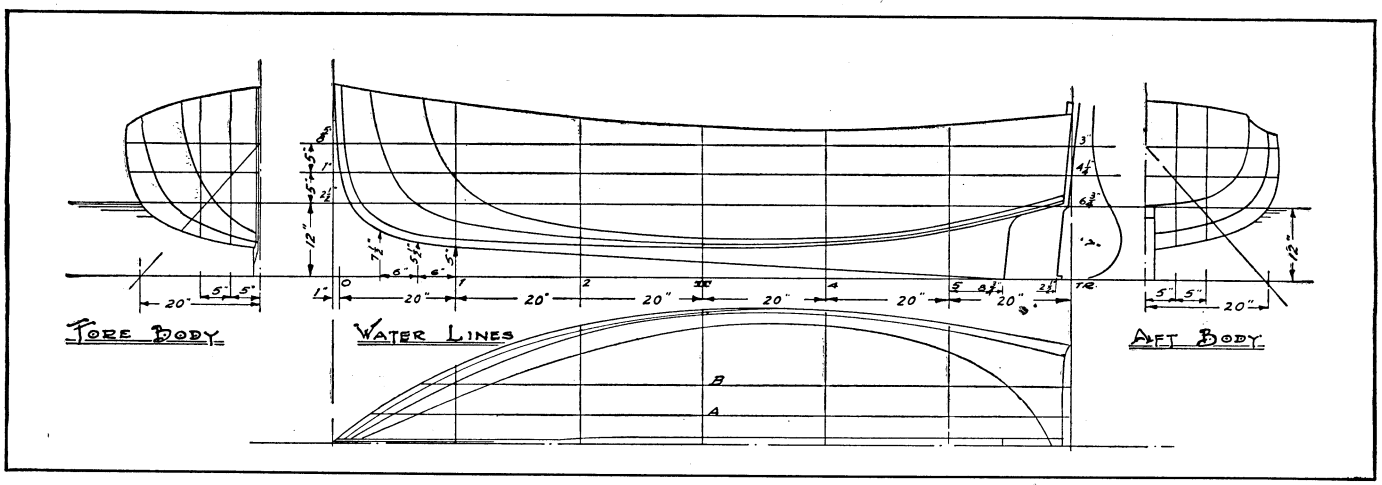
Now cut the mahogany side members, slotting them ⅛" deep for the bulkheads. Screw the deck plywood temporarily to the noseblock and tailblock, and screw the side members to the noseblock. And placing bulkheads 3 and 4 in position, bend side members around and screw to tailblock. The other bulkheads may now be installed, and deck screwed to side members temporarily to hold in place, with say four screws each side. There should be no screws through deck or bottom into *bulkheads,* except at the mast step, and through metal plate at footbar axis. Before doing any assembly, and after assuring yourself that all surfaces are flush, apply marine glue to the raw wood.

Limber holes for drainage are provided at the corners of each bulkhead, as in Fig. 5, cross-sectional views. When the bulkheads are installed to your satisfaction, turn the board over and screw on the bottom permanently, as in Fig. 6. Deck may now be removed for final work on the inside, such as putting in the fixed tube into which the leeboard axis turns, and short pieces of tubing for mast step and rudder pivots.

Cut leeboards from ½" plywood. Provide hubs, and secure to axis with removable pins or bolts. After a thorough sanding, apply several coats of spar varnish, working it well into the exposed edges of the plywood. Of course you let it dry and sand lightly between coats. All hardware should be brass or galvanized.

See plans on next page.


1
19"
2
5/8" TUBE
6"
3 1/4"
LIMBER HOLE
9/16"
12"
GRAIN
12 7/8"
COUNTER BORE 2"
WHITE PINE NOSE BLOCK
3"
4"
Fig 3
1 1/2"
2 1/2"
1/4"
1/4"
5/8" X 1 1/4" STEEL TUBE
3/8"
HARDWOOD FOOT BAR
3"
12"
1 1/4"
1/8" X 5/8" STRAP BRASS
3"
2"
1/2" EYEBOLT SCREWED INTO 1/4" BRASS DECK PLATE
8
TAIL BLOCK AND ALL BULKHEADS WHITE PINE
Fig. 5
7
6
5
4
3
2
1
1/8" VENT
1/2" CAP AND NIPPLE
SCREW EYE
HARDWOOD HAND GRIP
3/4" STAINLESS STEEL TUBING FIXED IN PLACE
9/16" X 5 1/2" MAHOGANY
Fig. 4
4 1/2"
1 1/2"
1/8" X 7" X 12" DURALUMIN RUDDER
1/2" BOLT IN 5/8" TUBE
2"
REMOVABLE 5/8" TUBE
WOOD HUB
LEE BOARD
Fig. 7
1 1/4" SCREW EYE BOLT, COUNTER-SUNK FOR STAYS
1/4" PLYW'D DECK
9/16"
7/8" No.7 SCREWS
1 1/8"
1"
Fig. 6
3"
MAST STEP
2" SQUARES
16"
1/2" EXTERIOR WELDWOOD PLYWOOD
24"



Always included in a boat plan is the lines drawing. The shape of the boat is shown by waterlines and buttock lines.

HOW TO UNDERSTAND A BOAT PLAN

By WESTON FARMER

A MAN BUILDS his own boat for two reasons: to save money and to have fun doing it.

With such inducements, it is little wonder that boating each season sees new recruits. These newcomers to the sport usually smoke along under a full head of steam until they actually decide to build. Then they need a few words of advice on where to start.

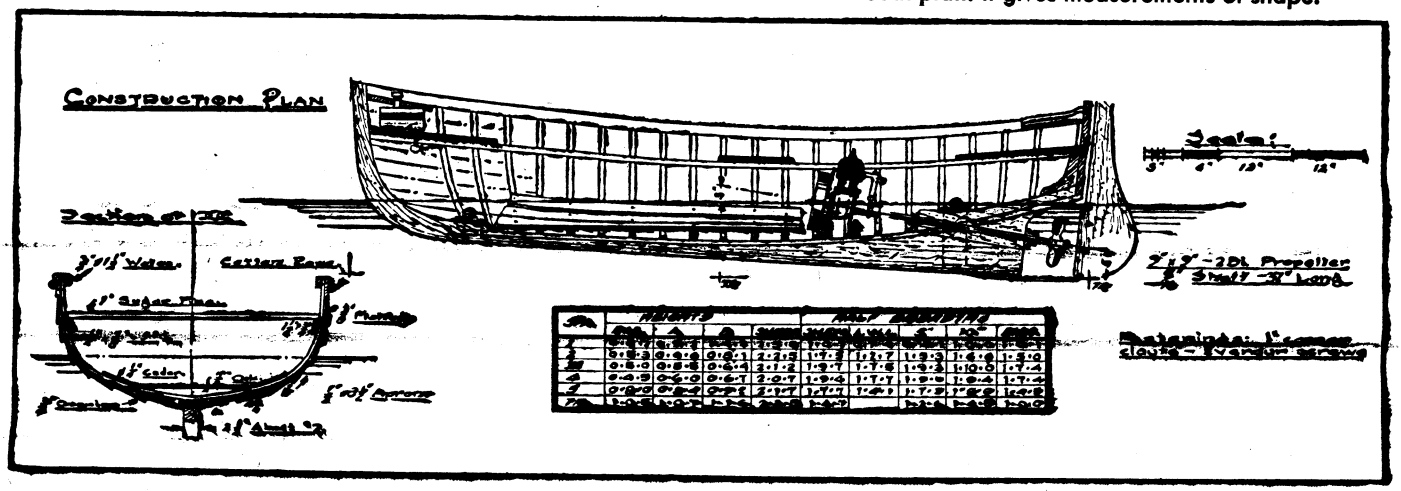
When you show them the rudiments on how to interpret a boat plan, a great light seems to dawn, and they make out very well.

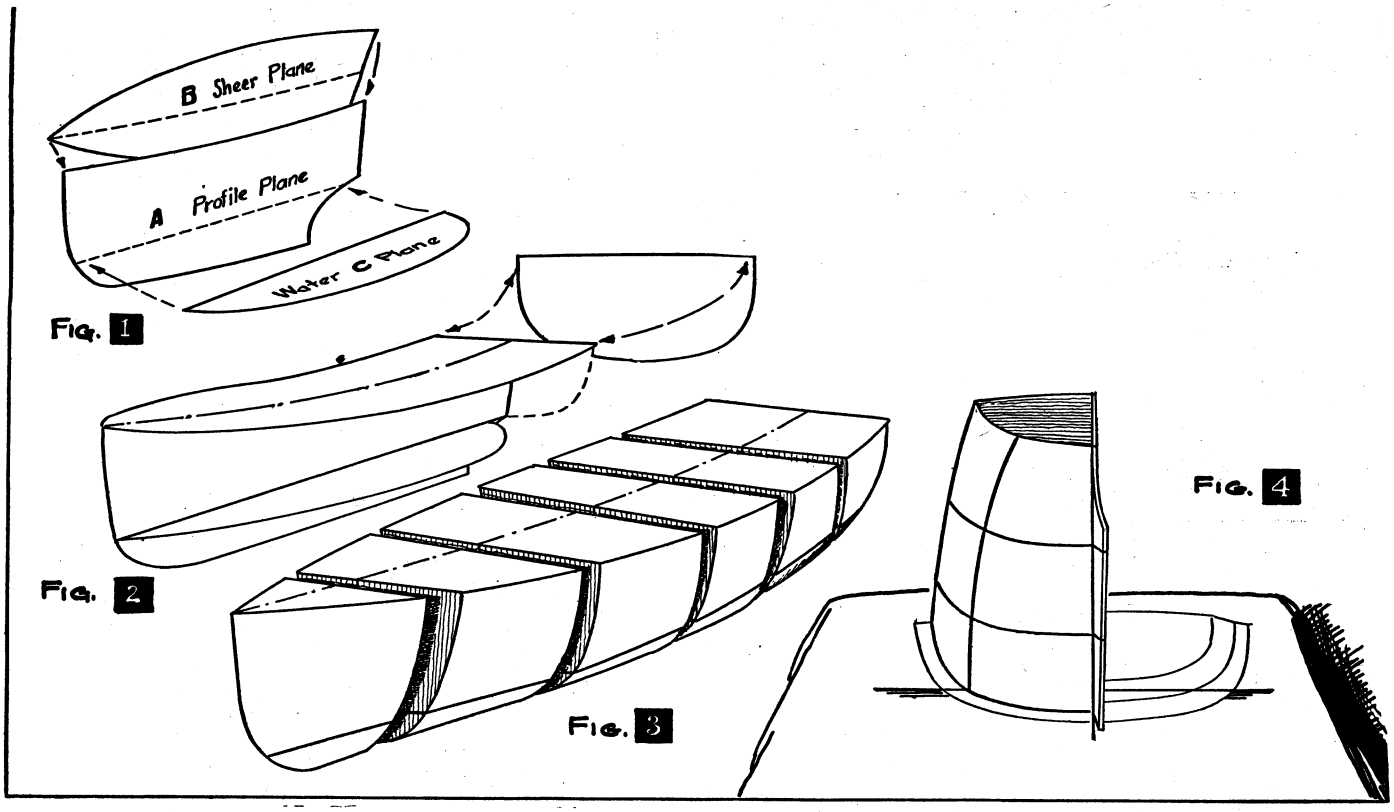
The first question they usually ask is, "How do you *read* boat plans?" The next question is, "Why are they drawn that way?" Here are the highlights:

A boat obviously is a three-dimensional structure. But the paper on which it is drawn is *two-dimensional*. The boat has form—length, breadth, depth. Paper is flat. It is the naval architect's job to depict on two-dimensional paper the shape which his boat must have to become, at the hands of the builder, the formed thing the architect designs.

To show the builder what he has in mind, the designer supplies a *lines drawing* which shows the boundary planes of the hull. He also supplies an *offset table*. The offsets

The inboard construction plan is a longitudinal section of frame elements. The scantling plan shows transverse positioning of hull structural members. An offset table is included in a boat plan: it gives measurements of shape.





The outline of a boat's hull is depicted by the planes it intersects. These figures (see text) show the progression in drawing.

are measurements for the lines from center *out* and from baseline *up* to points on the outboard face of the planking—measurements set off from center and base.

Custom has found it of most convenience to tabulate these measurements in three simple digits, reading in *feet, inches* and *eighths*. Thus the figure 1-3-5 in an offset table reads one foot, three and five-eighths: 1'-3⅝". In addition to the lines drawing and the offset table which enables a builder to lay down or loft the boat full size, various other drawings are supplied.

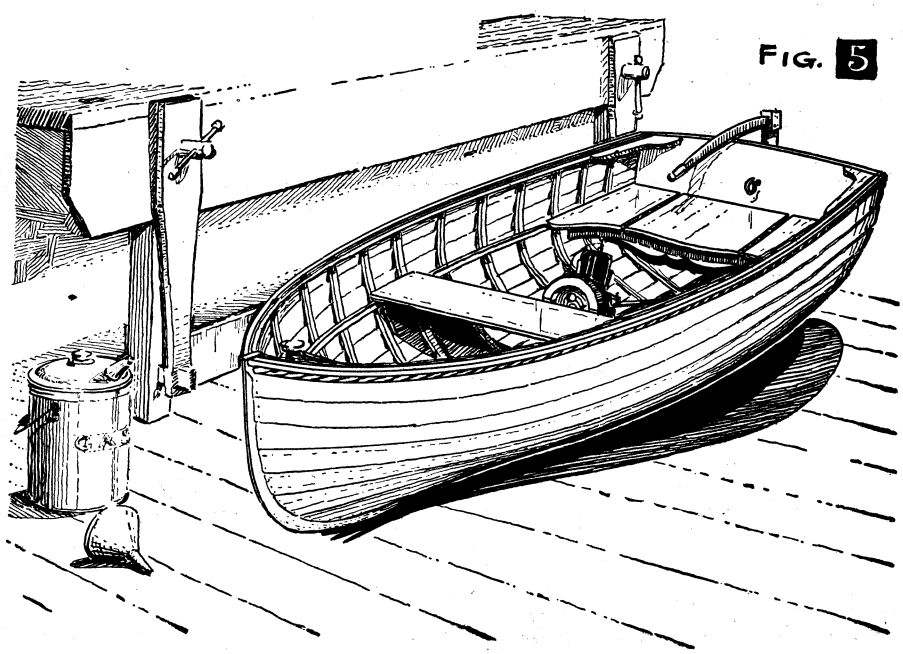
Always a *construction profile* must be shown. This is the inboard profile of structural elements shown as though the boat were split in two along the center of the keel and stem. A further key to the inboard profile is always given. This is the *scantling section*. It shows in cross dimension the sizes and outward locations of the elements shown on the inboard profile. This trio of drawings is all a knowing boatbuilder wants or needs to construct the average small boat.

An *outboard profile* drawing is given in nearly all but the simplest boats to show the external aspect afloat. In larger boats such as a cruiser or a runabout where there are several levels of construction when viewed from top down in plan, the *plan of framing* is shown. This plan shows framing, floors, deck framing, cabin sole (flooring) framing, and disposition of parts in the joiner-work scheme.

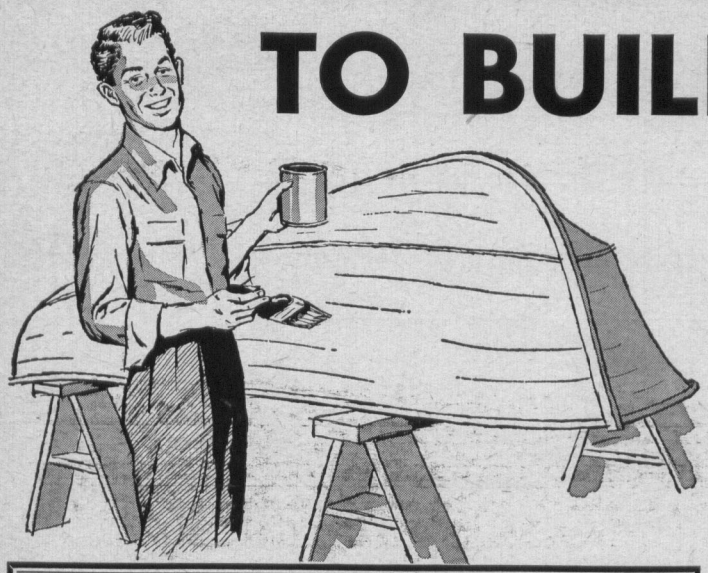
In such larger boats, usually more cross sections are shown to give the builder information as to where these pieces of joiner work go and how they are put together, hence these views are termed *joiner sections*.

As far as the builder goes, probably the most important plan is the lines drawing, for without exception the *boat must be laid out full size* on the shop floor or on a piece of building paper before the rigid mold or backbone on which the boat is

In the final boat you have merely fitted pieces of wood together to provide the hull shape shown on the lines drawing and body plan.



SO YOU'RE PLANNING TO BUILD A BOAT!



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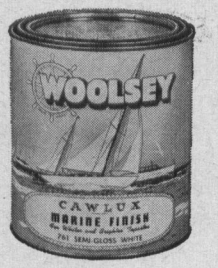
- The basic principles of "color-styling" boats.
- When you should use a spray gun and when you shouldn't.
- How to fill seams and cracks too small for ordinary, heavy-bodied caulking.
- How to make a "tack rag" to perfectly prepare surfaces for finishing.
- The step-by-step procedure for preparing new wood surfaces for painting.
- How to paint canvas surfaces and metal fittings.

3 TO GET READY

FOR A CAREFREE BOATING SEASON



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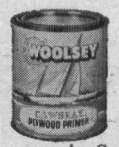

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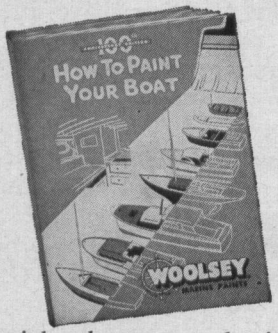

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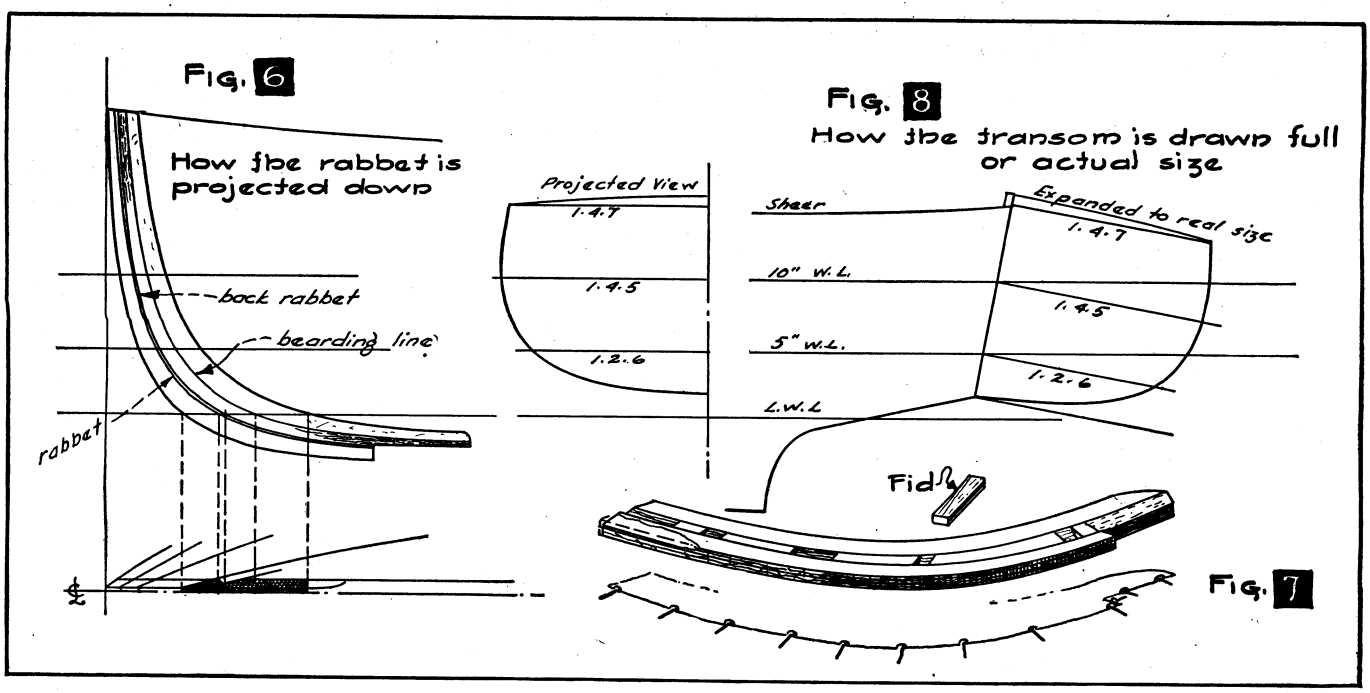


The stem of most boats is rabbeted for the hood ends of planking. Fig. 6 shows how the waterlines are projected up on full sized lofted drawing to give back rabbet and bearding lines. Fid is shown.

framed can be built.

To learn by example how to "read" a set of boat drawings and why they are drawn as you see them, take a good long look at the set of lines heading the opening page of this article. This set of lines is for a little 10-foot power dinghy. She is an inboard power boat. Her construction profile, scantling section and table of offsets are shown on this page. From the information given, you have all that the average boat yard asks for in building information—you could build a nice little boy's launch from these plans.

Because she is a boat of normal form, very small and hence understandable, and, being round-bottomed, which seems to bother most beginners, her drawings will serve ideally as a guide in explaining the starting points to you. (Her name is *Irreducible.*)

If you can "dig" the principles involved in this design, you can understand 'em all. Take a good look at her.

Now look at Fig. 1. This shows the profile plane "A" with which the designer starts. The profile plane is the boundary line showing stem profile, transom rake, keel outline and the character of the sheer line.

To give this silhouette three-dimensional form, imagine the sheer or deck plan cut out of cardboard, the outline of which gives boundary to the width of the boat as at "B," Fig. 1. To further give outer hull limits, also imagine the shape for the waterline, and we have water plane boundary as at "C," Fig. 1.

So on the equivalent flat paper drawing of *Irreducible,* we would now have—in two dimensions—the profile only. And below it in plan, we have the sheer outline and the load waterline.

Now our boat begins to take on form. To fill it in, imagine as in Fig. 2, that the boundary planes of sheer plan, profile and water plane all jump into proper three-dimensional relationship. If we can also imagine a pleasing transom shape and glue it astern by imagination, our vessel takes still more definite form.

The naval architect gives his boat its final bulk by shaping up the sections. If we now cut the bulk into sections as in Fig. 3, we get an idea of the change of hull shape from point to point along the profile.

If this stack of sections were now placed at a common center and a common waterline on flat paper as in Fig. 4, and the outline of each section were drawn on the paper, we would have a two-dimensional record of the sections necessary to re-create the boat we wanted.

This would give us the fore body sections and the aft body sections. It is usual to show only the sections for *half* a boat, as both sides are always symmetrical.

If we turned the boat in plan and pressed it through the paper, leaving a record of the horizontal boundaries, we'd have a deck line and a waterline. But *one* waterline isn't enough to give a builder the information he needs for laying out sections. He needs more check points.

So the designer gives us more waterlines. In *Irreducible,* two waterlines are drawn in at 5″ and 10″ above the load waterline. You get the plan shape of these from the sectional views drawn beneath the profile. A baseline, 12″ below the load waterline is also drawn in to give a point of departure for heights of the intersections. But this still isn't enough.

You need check points between waterline and the keel rabbet. So the designer uses what are termed *buttock lines.* These are slices through the hull in vertical plane, outboard of center.

In this design the buttock lines are 5″ apart. This gives you points on the sectional plan by which you can locate the sweep of the mold sections from keel rabbet to waterline.

To tie all of these check points together, and to prove fairness, a designer frequently slices the hull, as though with a band saw on a solid model, by a diagonal line. Sometimes these diagonal lines are projected in plan view. To skilled eyes, they tell

much of performance, particularly with sailing vessels.

In *Irreducible* the diagonals are not projected down, serving merely in the offset table as additional locating points for the sectional shapes.

To sum up: Each of the lines in the lines drawing represents the boundary of a *plane* passing through the hull shape. By measuring off these points with reference to a center line and a baseline, you can reproduce full size on the floor of your shop the boat the designer intended. Why must you do this?

You do it to mechanically save a lot of time, to avoid errors. There is *no other way* to build a boat if it is built from plans. The reason is simple: As shown in Fig. 5, the boat has planking; she has frames; she has a transom. All these are shown in the construction profile and scantling section. All of these pieces must go together and fit.

The stem is rabbeted for the hood ends of the planking. (See Fig. 6) The transom must be expanded to real size and beveled for the stream the planks will take. (See Fig. 8) The planking has thickness and so do the frames. These must be *subtracted* from the outside hull shape the architect draws. (See Fig. 10)

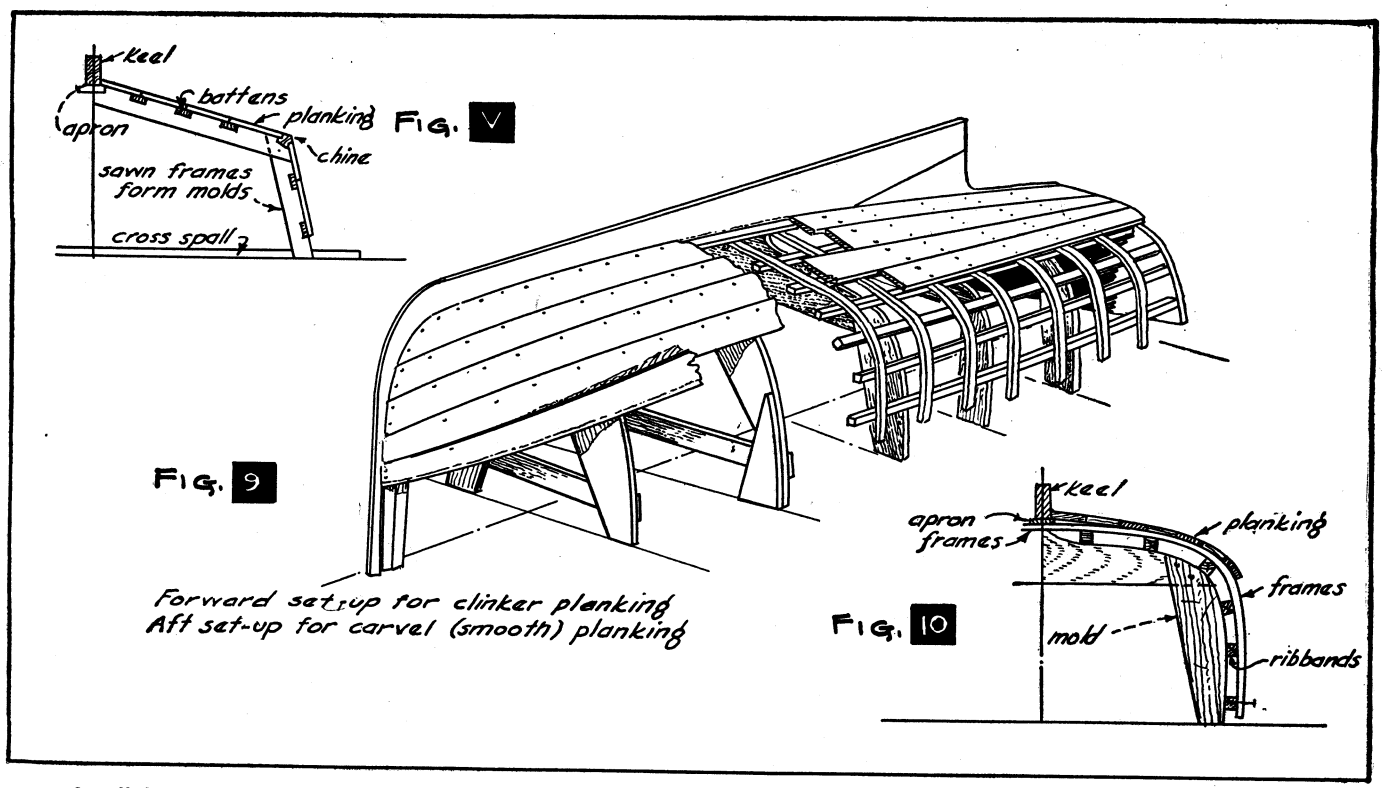
All of this must be done *full size.* You can't scale a small blueprint 1/12th or 1/16th the size of the boat and get the necessary bevels, nor fair cross sections.

No one but the novice would build a boat without laying down the lines full size, checking for obvious errors in scaling, and *fairing* the whole thing.

Further, a stem must be got out. Usually you do this by transferring the lofted line to lumber by inserting nailheads around the line and hammering the character of the curve into the lumber. This is shown in Fig. 7.

Templates for cutting knees and the keel and shaft log are needed. And if they are to go together, you must take them from an integral master loft drawing. If there were no other reasons but these for laying down the boat full size, it would be enough for a good mechanic. But always there are some who think this a nuisance.

Once laid down full size, the shape of the hull has integrity and matches the lines drawing, and the main pieces of the hull frame such as stem, knees, and expanded transom, are in



Small boats are best built upside down as it is easier to finish off the planking. Framing setups for both clinker and carvel type shown.

size to transfer to lumber.

At this point, for the novice, the only seeming constructional mysteries have to do with getting out the stem and expanding the transom. Fig. 6 shows how you project the waterlines on the profile down to the half siding of the keel to stream into the stem. By drawing in the planking thickness behind the plan waterlines, you can find the lay of the rabbet, the back rabbet, and the bearding line.

As in Fig. 7, a small piece of wood called a "fid" can be used to gain in small pockets along the rabbet and bearding line. After these gains are cut in with a chisel, the pockets are connected by cutting away the intervening wood.

As shown in Fig. 8, if the transom is on a raked angle, it must be expanded. This merely means it must be drawn to real size. If you were to project the transom as shown in the aft body plan in strict elevation as shown to the left in Fig. 8, then build the transom to this outline, you'd find it too small, because you would not have allowed for the slant, or rake. The drawing is self-explanatory.

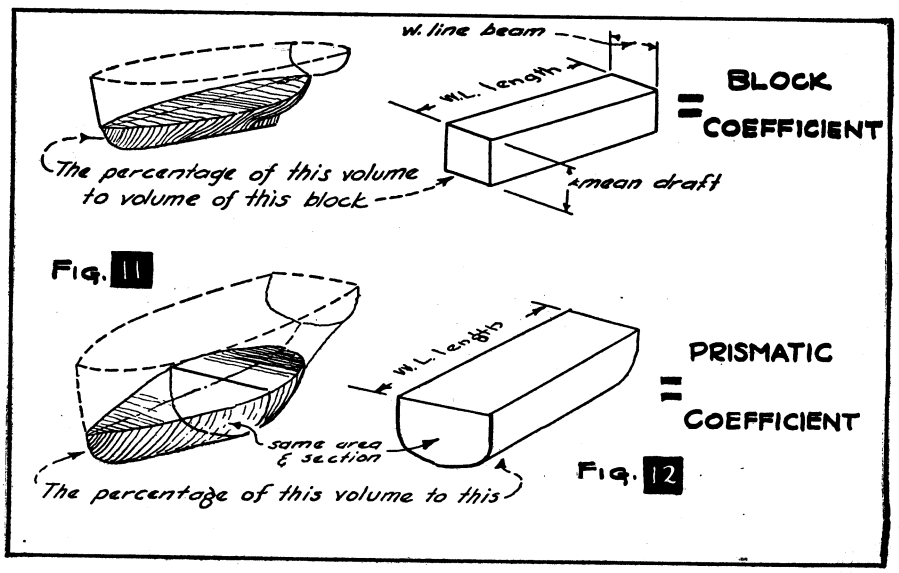
Boats have dozens of types of construction. Hull shape may be round or V. But the basic idea behind the plan, when you start to build, is to get the correct shape for the hull. Then, as shown in Fig. 9, provide a secure set of forms on which to frame and plank the boat.

For some reason, the V-bottomed seam and batten type of boat, shown in Fig "V," is readily understood by beginners. The frames of the boat itself, and the battens, are left in and become an integral part. Such construction takes nice lofting, and the frames must be beveled and faired to a hair.

The professional boatbuilder, using methods evolved by his craft over thousands of years, makes an easier thing of building by preferring to build round-bottomed boats. The form, as at Fig. 9, can be built of junk lumber, the ribbands over which the frames are bent by that most useful device, steaming, can all be thrown together so they fair themselves, and the resulting boat, being made of smaller and more pliable pieces, is easier to build.

Small boats like the one shown usually are built *bottom up* as they

Some designers put all design coefficients on their plans. Here explained are what is meant by block or prismatic coefficient.



can be easily turned over, and building thus is easier on the back; provides down drive for fastenings; is immediately ready for planing and sanding.

The boat shown progressing in Fig. 9 shows the clinker planking method forward. In this method, the strakes are clinker fastened about the molds, and then the frames are steam bent in later.

Steam bending is a wonderful help in boatbuilding—any old box or pipe which will hold frames can have steam piped into it at atmospheric pressure. Rags stuffed in the end of the box will contain the steam while it gives off its high heat of condensation. It is this heat that softens the wood, and lets you tie knots in it.

The aft half of the boat framed in Fig. 9 is being planked carvel, or smooth seamed. For this, the setup of the molds is shown in Fig. 10. This is depicted merely to bring home the point about lofting: Notice that the thickness of the planking has been subtracted, then the thickness of the frames, then the thickness of the ribbands over which the frames are bent. The resulting mold is much smaller than the designer's body plan. How else would you get the size of this mold and its proper bevel except by lofting?

Novices often ask us about design data that is sometimes put on small boat plans by designers who like to knock themselves out technically in a sort of, "Look, Ma! no hands!" way. The letters ask, "What do those things called coefficients mean?"

Without philosophizing on the value of coefficients, G.M. and other terms which is merely dipsy-doozy stuff when applied to puddle jumpers, let me say that such coefficients sometimes help a designer, particularly on larger vessels in preliminary stages when imponderable weight and form must be nailed down.

The block coefficient—shucks, the sketches in Figs. 11, and 12 show *what* they are. You can dope at a glance the meaning of these percentages. How to use them will be of no concern to the amateur boatbuilder. Suffice it then to merely show what they are.

All of the foregoing, from the masthead to keel, should be helpful in enabling you to understand your boat plan. The reasons "why" have been extolled here. The "how" of framing and building is proper matter for the article to follow.

HOW PRAMS

with Plans for "*JENNIE*"

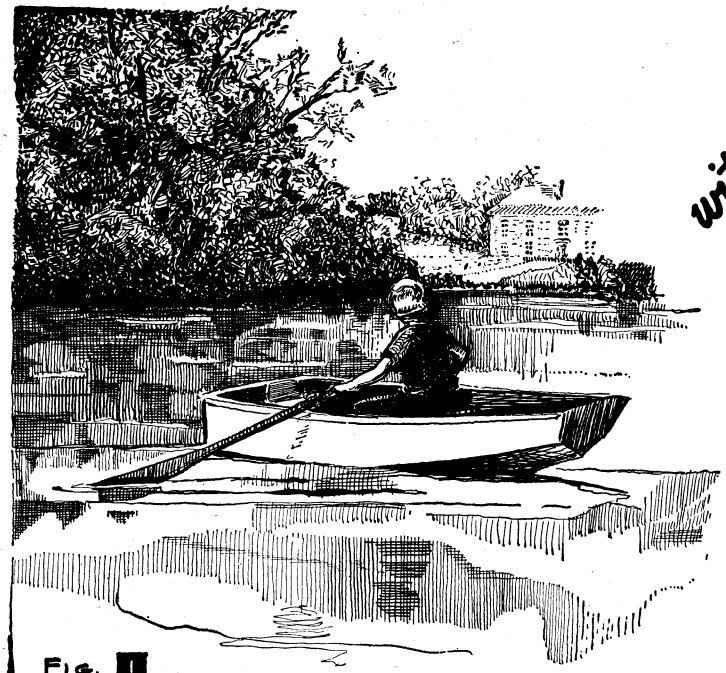
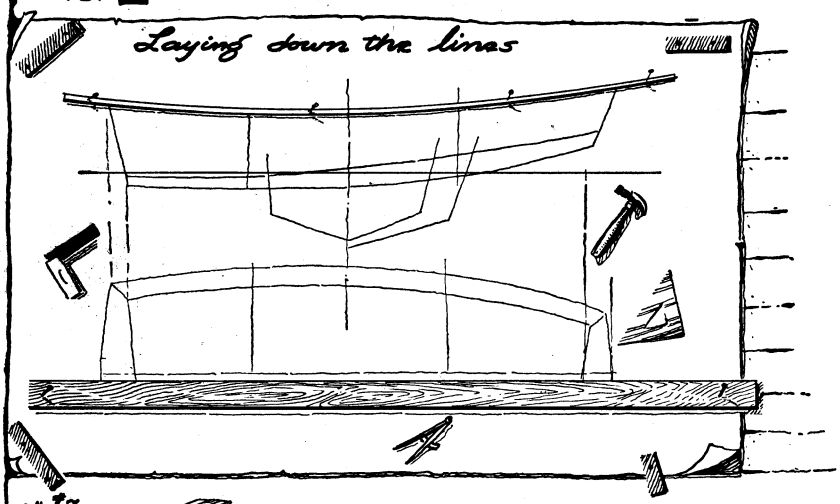


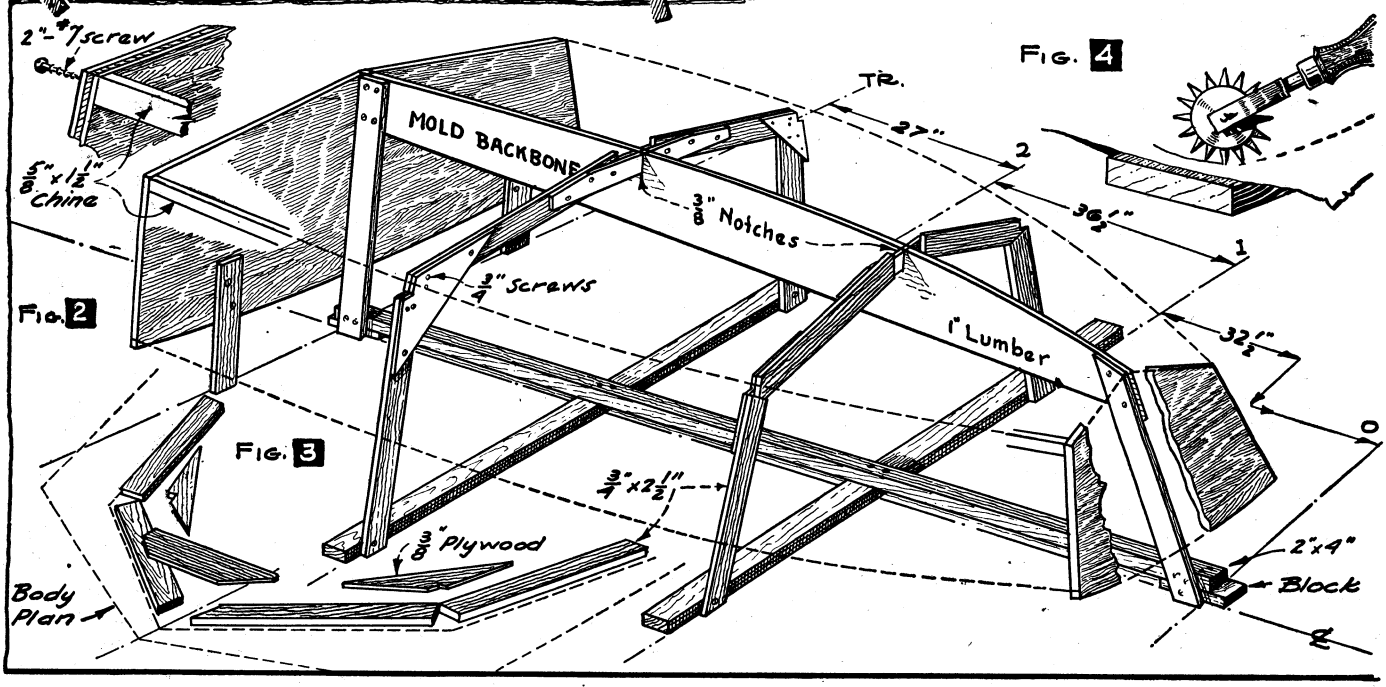
Fig. 1

All prams are pretty much alike. Here is how they are built, showing by example how to build your own

YOU SEE PRAMS everywhere. They are numerous as lily pads. Why? They're duck soup to build, and they're light, useful, and fun. Here is the dope on them, with plans for a good one. I've named her *Jennie* because she is plump, and plain—a little wren in the boat family.

The pram may seem a new type, but actually they are old, being English in derivation. Until plywood got itself waterproof and gave everybody a cheap hull covering, the only prams you would see were rather





The first step in building prams is the same as for any boat. Lay down the lines first. Fig. 1 shows how to lay out paper on the shop floor—straightedge, square and other tools will be needed. As shown in Fig. 2, a false strongback is set up on which to erect the molds and the bow and stern transoms. All molds are made to size on the shop floor, over body plan as at Fig. 3.

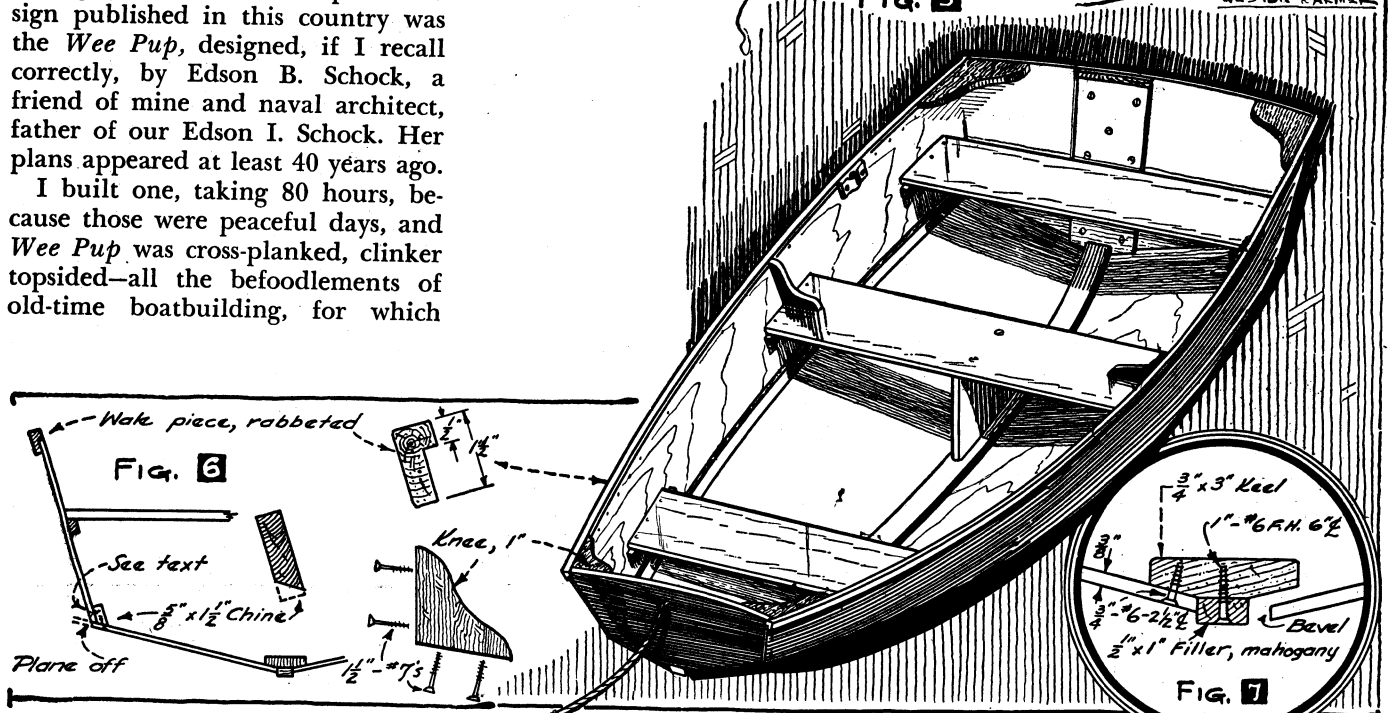
ARE BUILT

an 8-ft. Pram

By WESTON FARMER

heavy. So they were used chiefly abroad, mainly as mooring tenders to pint-sized British singlehanded sailing yachts. The first pram design published in this country was the *Wee Pup,* designed, if I recall correctly, by Edson B. Schock, a friend of mine and naval architect, father of our Edson I. Schock. Her plans appeared at least 40 years ago.

I built one, taking 80 hours, because those were peaceful days, and *Wee Pup* was cross-planked, clinker topsided—all the befoodlements of old-time boatbuilding, for which



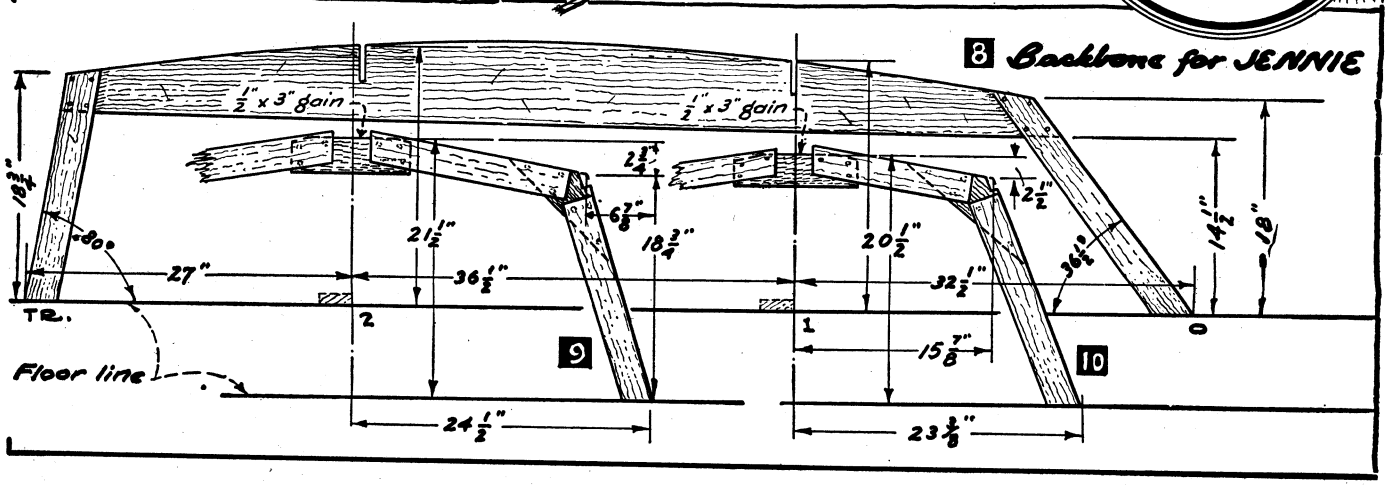
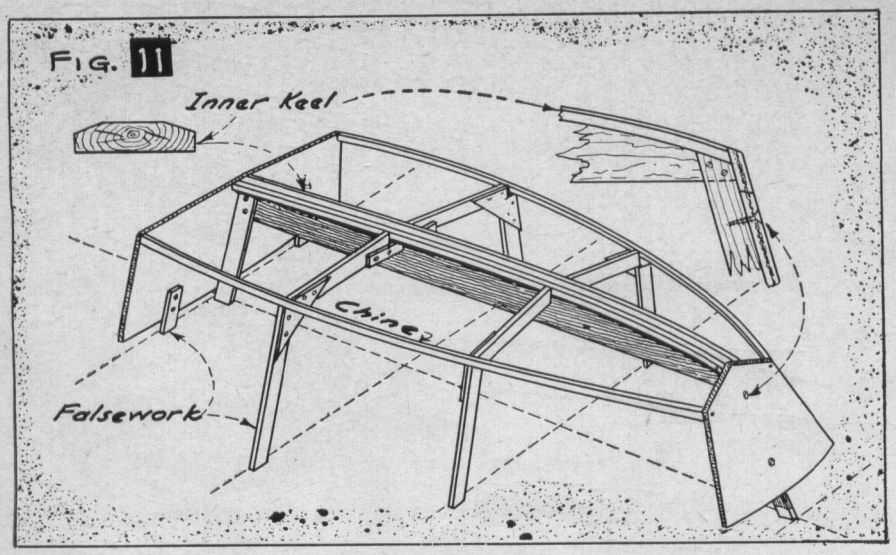
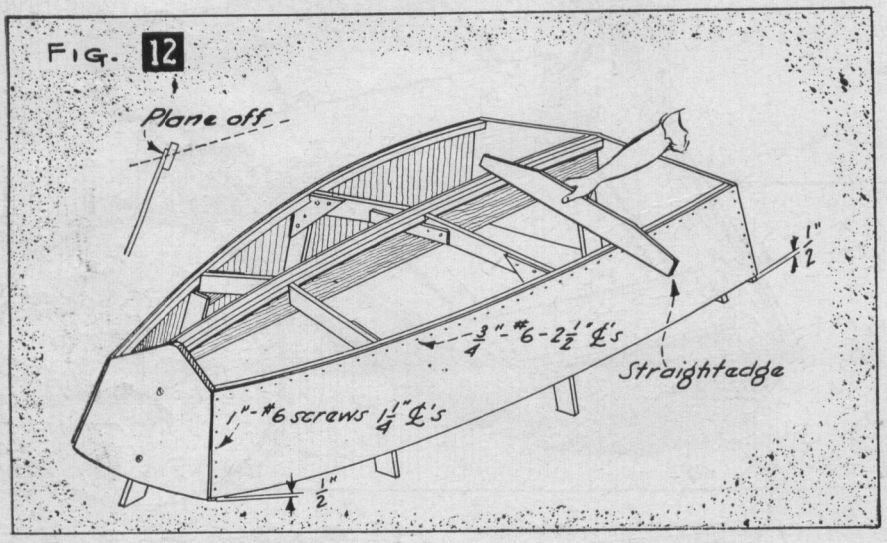


Fig. 5 is a perspective drawing of Jennie complete for small outboard power. Fig. 6 is a scantling section of this pram's construction. Fig. 7 is a section through keel, planking and filler. Fig. 8 shows the rough lumber plan in the building backbone. Figs. 9 and 10 show how the temporary molds are scabbed together by plywood gussets. Note backbone slots for gussets.



Here's the initial setup. The strongback is centered, the bow and stern transoms are temporarily screwed to the cant pieces. Temporary frames are erected, the keel and chines then streamed.

After the chine stringers are bevelled, the topside plywood is put on, using fastenings as stated in the drawing here. To accommodate the rabbeted wale piece (Fig. 6) the sheer is ½" shy of true line.



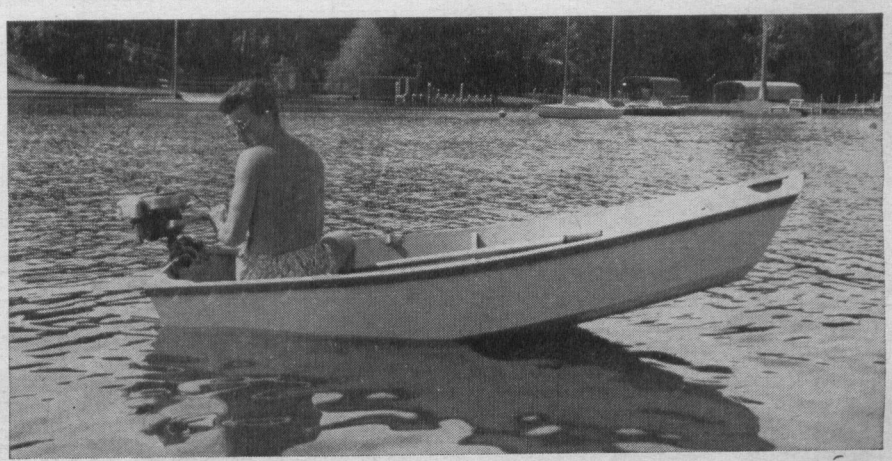
there is now little patience. Along in the late thirties when waterproof plywood was developed to a point where it wouldn't festoon about its fastenings, a good designer named Charles MacGregor—God rest his departed soul—latched onto the new material and started experimenting.

Among many designs in plywood, he published one of Sabot, a cute trick of a pram. Soon after this date Hagerty began putting out his famed Seashell kits, over 32,000 of which are now slopping about here and yon.

Other kit concerns like Chris-Craft, U-Mak-It, Roberts . . . nearly every kit boat supplier now has a pram kit in his stable. By now the practical length is standardized at around eight feet, and prams are all pretty much alike.

A pram's chief usefulness is as a cartop dinghy which will enable you to moor your larger craft in a safe roadstead. It next is serviceable as a tagalong dinghy. It is useful for gunkholing, and might conceivably have some value as a "lifeboat" in expert hands. They *can* be rigged with sail, but are poor sailors, to my notion, and scarcely worth the extra cost of building the rudder, mast, dagger board and trimmings. The same money on a different hull shape will give you better satisfaction. Still, plenty of people are flapping about like little butterflies, driven by a pocket handkerchief for a sail.

For agile kids, who can flip about when ready to tack, they'll be fun. But adults will have small patience making one foot of leeway to every two feet of headway. To me this is not sailing. Nor is hunkering about on the bottom, flat-fannied on every tack and getting beaned by the



Here is Jennie as designed by naval architect Weston Farmer. Shown on her stern is a lightweight Johnson of 1½ hp. Little mills like the Elgin outboard or a "malted milk mixer" like Elto Cub are all she takes.

hard-hitting boom, any fun either.

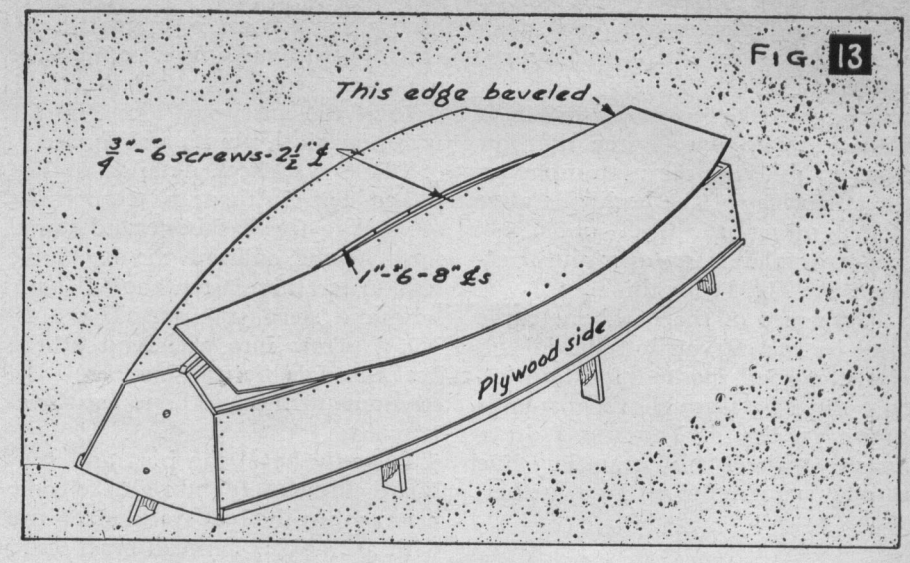
Still, for those who like to dream, and need to be shown, I have sketched the ideal dream of a sailing pram usually held in the beginner's eye, and have suggested a sail placement and suitable area. This is done without going into too much detail, because anyone expert enough to sail one of these rigs can supply his own dagger board installation, mast and rudder from experience. Others shouldn't try it.

Jennie, as a standard pram, will be within an inch or two of being about what all prams are. How are these little crafts built? Take a look at Fig. 1.

This shows how the lines are laid down and faired up on the workshop floor. Your guide for this work is the drawing of the lines as shown in Fig. 17. It is best to fair to full size. Then all things jibe.

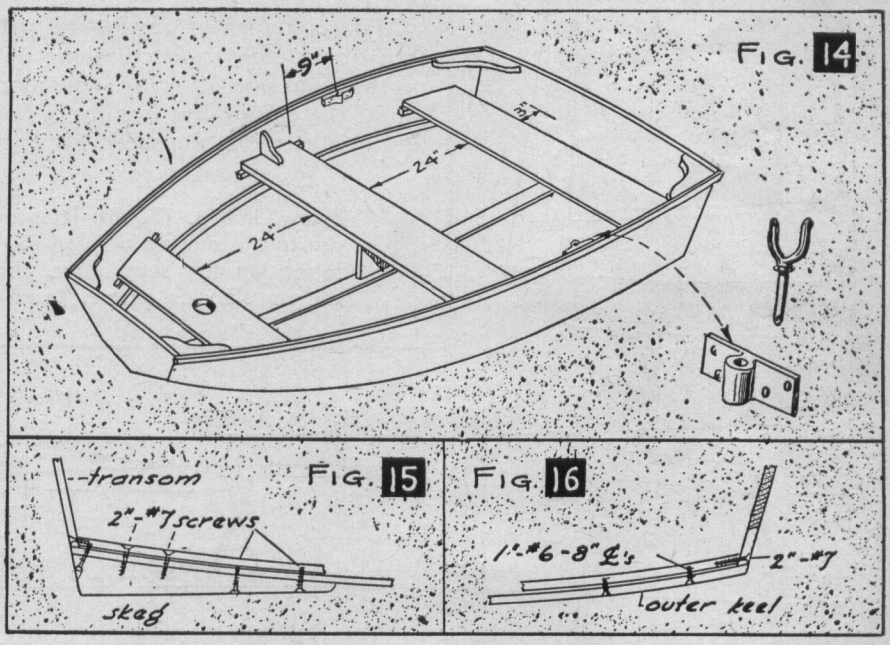
The idea is to erect a framework, or backbone, as shown in Fig. 2. To do this, you lay down a center line on the shop floor. Then at stations 0, 1, 2, and TR (transom), run lines at right angles to the center line. Next construct the backbone for *Jennie* as shown in the drawing at Fig. 8. This drawing shows also frames one and two (Fig. 9 and 10). They are put together either from the dimensions shown in Fig. 8, or are more neatly and carefully erected on the flat from the body plan which would be your third step, or as shown in Fig. 3. Note in Fig. 3 that the body plan has been laid down full size, and that *planking thickness must be subtracted.*

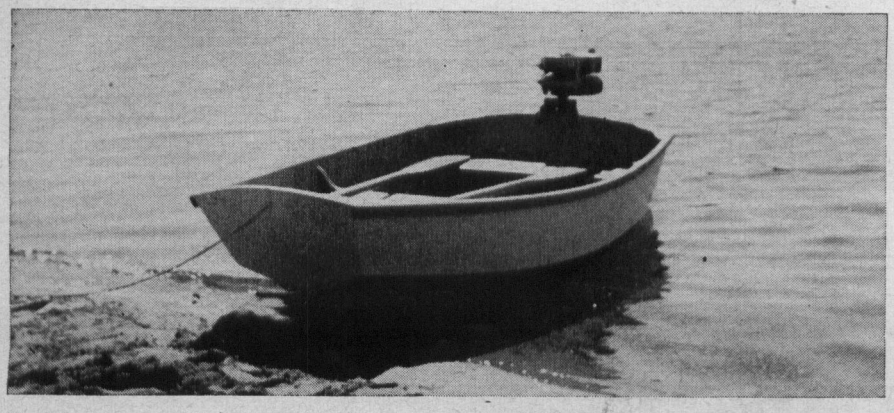
It is usual in prams without frames to use ⅜" exterior grade plywood. So members 1 and 2 (Fig. 9 and 10) in such case would be *temporary* and *not* part of the boat. If you use ¼" plywood, I would suggest leaving the frames in perma-



Fit the edges of the bottom panels by bevelling keel edges as in Fig. 7. Then start fastening amidship at keel and chine and work forward and aft with screws (see text) and laying seams in compo.

Fig. 14 below shows seat spacing. Note panting bench under middle thwart. Flat strap rowlocks are screwed to the wale piece. Fig. 15 shows fastenings at stern end on skeg. Fig. 16, screws at bow.





Jennie just after launching. A hole in the bow transom with knotted line run through provides a bow line. Five-foot oars stow well. Note quarter and seat knees and motor.

nently, and placing the seats on a suitable riser, say 5/8"x1¼" mahogany.

With the preliminary frame or backbone erected as shown in Fig. 2, your first step is to fasten the bow transom and the stern transom on the down legs of the backbone after *first* bending the keel of ¾"x3" spruce or mahogany over the backbone. See Fig. 11 for this step.

The sweep of the backbone curve must be fair. If you loft the job on paper, a good method for transferring the line through the paper is shown in Fig. 4. You use a dressmaker's wheel to transfer line through paper. Before I go further, and before you get into any difficulties following the simple steps, please make sure your floor is quite *level,* or that the falsework (See Fig. 11) is symmetrical, plumb and square.

The ¾"x3" keel, detailed in Fig. 6 and Fig. 7, then, is temporarily secured to the backbone and sawed flush at the ends of the backbone legs. After this, fasten the ¾" 5-ply bow and stern transoms. Use a 2" No. 7 screw into each end of the keel through the transom. Screw the transoms to the backbone legs—*temporarily.*

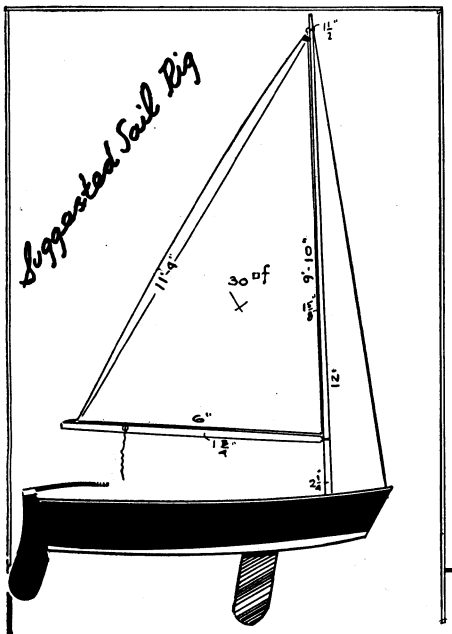
Properly bevel the port and starboard chines (left and right) to come neat against the bow transom. Secure with a 2" No. 7 flathead brass screw into each chine. Stream the chines into the gains or notches at each frame station as shown in Fig. 11 and as suggested in Fig. 2. The plywood gussets used on the frames *face* each other. This will facilitate bending the chines. With a saw, and careful cutting, chop the chines at the stern transom and fasten with 2" No. 7 screws.

Make a paper or cardboard pattern of the sides, and cut these out on the band saw, allowing some margin at the chines, but holding a fair and final curve to the sheer. See that the sheer is set ½" *above* the transom edges to accommodate the 7/8"x1½" rabbeted mahogany wale piece as detailed in Fig. 6. The extension of the transoms to accommodate this ½" rabbeted dimension is marked in Fig. 12, which clearly explains it.

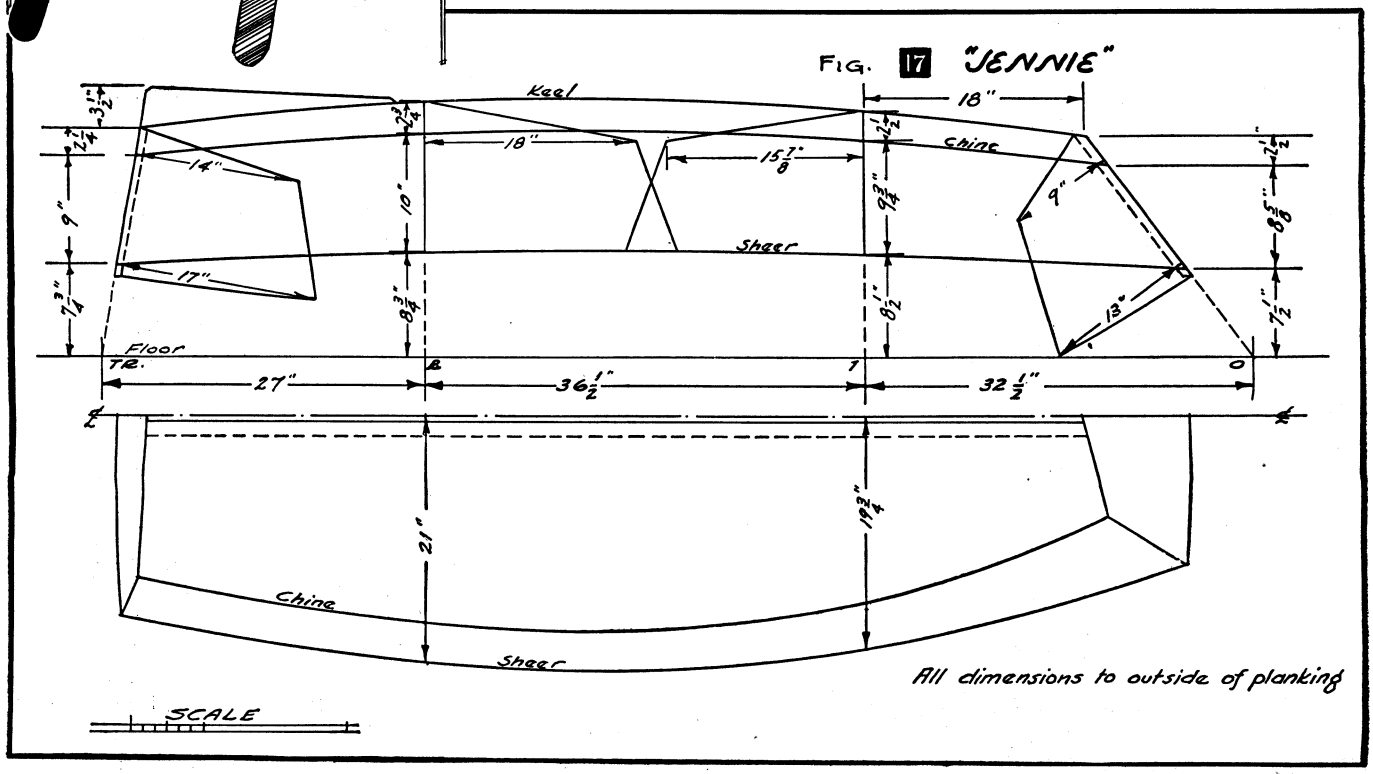
Use 1" No. 6 flathead brass screws on 1¼" centers on the bow and stern transoms through the plywood sides. And for securing the plywood sides to the chines, use ¾" No. 6 flathead brass screws on 2½" centers. Drive the screw heads flush, or sink them but very little, after which they will have to be puttied.

Next, trim the sides flush with the transom faces and the chines. A ripsaw will handle this detail at the chine edge. Then the flat on the keel and the bevel of the chine must be planed off (Fig. 12) using a straight edge for the purpose of getting a good, flat, faying surface. Don't plane off any stock below the inside face edge of the chine piece or the flat of the keel. In other words, no hollows or bumps in a fore and aft direction.

Fasten the outer keel of ½"x1" mahogany in the center flat of the inner keel, using 1" No. 6 flathead brass screws: two at each transom, a few at 6" centers, the balance at



Below, in Fig. 17, are lines and measurements for Jennie. These are to the outside of planking and must be laid out full size and faired on the shop floor, then planking thickness deducted. A sail rig showing proper area and cut of sails looms off to port.



Jennie under way. Don't expect this little ship to be a speeder—her bottom is too highly rockered to drive fast. For one man operation a stick can be run into the steering handle to give extension of length. You'll have a lot of fun for the $25 she'll cost you!

8″ centers. It would be well to lay this in waterproof casein glue or light seam compo. This is detailed in Fig. 6 and 7.

Make a pattern sufficiently oversize to accommodate for the bend of plywood about the bottom, and get out the bottom panels.

By judicious fitting and fairing, bevel the edge of the bottom panel joining the inner keel until it fits closely. Pay on a little seam compo along the keel and chine edge, and commence fastening down the bottom panel with screws, as shown in Fig. 13, using ¾″ No. 6 flathead brass screws on 2½″ centers along the keel and chine. Use seam compo sparingly under joints—just enough to seal the joint. Into the transoms, drive 1″ No. 6 screws on 1¼″ centers. Plane off the bottom outer edge at the chine as indicated in Fig. 6. In Figs. 6 and 7, incidentally, you see sectionally every piece in the boat and this is the scantling section usually provided by the naval architect to show a boatbuilder what size members are and where they go.

Your pram is now ready to turn over. Simply free the backbone and frame jig from the cross members on the floor, or better yet, lift the whole thing from the floor and turn over. Install the middle seat before removing the jig. This is of 1″ spruce, redwood, or mahogany stock, and rests on 1″x1½″x12″ risers bolted through the plywood with flathead stove bolts, over washers. Such treatment keeps the boat in shape. Make a pattern for this seat length—don't jam a seat down: it will expand the hull, warp it, and cause you trouble.

Next fasten the skeg, using four 2″ No. 7 screws, two from inside, two from outside, as shown in Fig. 15. An additional canted screw may also be used at the very bitter end of the skeg. This skeg is of 1″ stock and shaped as shown. The skeg gives directional stability under oars and when towing.

Next, you should put in the stern seat and the bow seat. The cleats for these seats should be about 5½″ below the sheer. This will put the seats themselves at the proper level. Under the middle seat place a bench, or stiffener, as shown in Fig. 5. Fasten through the seat into bench with 1½″ No. 7 screws (two) and through the keel into the bench with two 2″ No. 7 screws. The small knees on the center seat as shown in Fig. 5 will help stiffen the boat immeasurably. Use 1½″ No. 7 screws here. Two to each leg of the knee.

Fasten the wale piece over the top edge of the side planking, using 1½″ No. 7 screw into the transoms, and ¾″ No. 6 screws on about 5″ centers through the side plank, inboard, out to the wale. Next install the knees, as shown in Fig. 6 and Fig. 7, using 1½″ No. 7 screws into the knees.

The rowlocks are of flat strap type, best fastened with flathead brass stove bolts, riveted over the nut. Use open oarlocks, as sailormen should. The landlubber, or pinned variety, are dangerous, and trouble makers. You can't feather your oars with them, and they require more dip and lift than open oarlocks. Use five- to six-foot leathered oars.

The whole hull must now be sanded. Don't try to handplane the plywood. The plane bit will dig into it and it will tear. Use a couple of coats of Firzite grain sealer, sanded off well, before applying two coats of good marine color of a shade that pleases you. Allow each coat to dry, bone dry. Nothing so assures boat longevity.

Step by step directions just as have been given are about as entertaining as reading about old lead pipe, so I have condensed them to grim adequacy. If any points are not clear, I suggest reading, and doing the necessary eye-jumping from drawing to drawing until the boat has been built in the mind's eye. Then the job will be simple. Anything fully understood is never complicated.

The sailing rig, as I have stated, is sketched for the amazement of those who would like to noodle the idea of sailing such a boat. If you want to sail a pram, you'd do better to buy a kit put out by a manufacturer who has worked the bugs out of his outfit. These little fellers are touchy. You cannot "balance" a sail plan on a boat this size with any accuracy, because the loads vary so much. Anyone who is a fair sailor can cook his own rig. And a novice, if sailing he would go, is better off spending his cash on a hull of different proportions than *Jennie*. As to costs, you can buy the materials for *Jennie* for a couple dozen dollars.

Figs. 16 and 17 and on are sufficiently clear to need no further explanations. Happy dunking!

BUILD *MUCHO GUSTO*

By DAVID D. BEACH

IF you're a speed enthusiast who wants high standards of performance from a boat that has the comforts and appearance of the smartest custom runabout, *Mucho Gusto* is the answer to your prayers. For thrilling jaunts with another passenger, or for towing a single aquaplane or water skier, *Mucho Gusto* is your baby.

Mucho Gusto is also economical to build and operate. It is a plywood-planked craft, constructed of universally available lumber, and is powered with an engine in the 25-to-45 hp range. The engine shown on the drawings is the standard 2:1 reduction gear Crosley which delivers 25 hp at about 4800 rpm's. And by addition of Braje or other hop-up accessories, it can put out about 40 hp on normal fuel.

Let's not spend more time discussing generalities when the drawings can tell so much more. The outboard profile and deck arrangement shows a boat which you'll admit is at least rakish looking. The hogged sheer, the raked windshield and the two-toned paint scheme—for which purple and light yellow are suggested—combine to provide a craft which will be the center of attraction at every dock.

Can't you picture yourself behind that wheel, doing figure 8's off the club anchorage, or out in the lake with the after-lifting eye doing double duty as a towing cleat for a water skier astern? Better still, picture that same skier waving to the boys on the dock as you skim by! You'll need little more than that to sell yourself on the idea.

If you build her yourself, you'll have to study the two other drawings which detail the shape and construction of the craft. But if you'd just as soon pass by the building and place an order in some local boat shop, all you need is the ability to write a proper sized check.

The three drawings which comprise the building plans for *Mucho Gusto* are drawn in professional style, but with such notes and sections as are required by most amateur builders. The professional boatbuilder will find the drawings a pleasure to work from as will the experienced amateur.

Others who are "handy-to-skilled" with tools, had better read one of the better books on building small boats. *How to Build Small Boats* by Edson Schock, is one. Robert Steward's *Small Boat Construction* is another. Both of these books outline the general problems of laying down full-sized lines and making framing and stem templates. These two items are the only major problems in building *Mucho Gusto*.

The lines and offsets plan gives the conventional plan, profile and body-plan sections, and also the major dimensions of the frames. Note that the table of offsets gives the offsets to the *outside* of the planking, but that the seven framing sections provide dimensions of building form frames to the *inside* of the planking before bevelling. These dimensions were scaled from a drawing made to a scale of 1½ inches to the foot and are probably right to within a few sixteenths of an inch. That's where the full-size layout proves its worth. A shim along the bottom of a frame to compensate for a scaling error by the architect, or a few heavy strokes with a plane for the same reason is the most penalty you'll have for ignoring the lofting job and building from the frame sections. However, the stem and transom should be checked *full-size* before fabricating any stock. This will prevent headaches later on.

The double baselines, 36″ apart, are about right for comfortable working. As the framing sections on the lines plan show, this permits easy downhand work on all parts of the structure, including the several fastenings to be driven through the bottom and side planking. If you build on a jig, or set the frames up on a building form, don't go much higher or you'll have to stretch to reach the center. And if you go lower to save on the length of the side frames, you'll get a stiff back from working at too low a position.

Now let's look at the structural plan, and first at the longitudinal section at the top of the drawing. This construction profile shows the boat along the centerline, looking to the left-hand side. It shows a lot, as you can see, but your attention is directed to several features which make *Mucho Gusto* a husky craft, able to absorb punishment from choppy water when afloat, and from rough roads when trailer-borne.

The backbone is an oak keel, fairly husky for a boat of this length, but ample to permit some latitude in locating fastenings thereto. A pair of stringers run about 10′ 3″ from the transom to the second frame and are securely bolted, through oak tripping brackets, to each frame as indicated. The seven frames are spaced 20″ for the most part. And combined with the two bottom battens and the chines, they provide amply small panels for the ¼″ plywood planking used throughout.

There are other features in the profile about which you'll get more later on.

The figure in the *middle* of this drawing shows the deck and bottom framing, together with several important installation items. The upper half shows the deck structure without the decking, while the lower portion shows the bottom framing from a level just above the stringer top. The sections at the bottom are, with the exception of the transom, taken a bit behind the framelines, looking forward. The transom struc-

Flashing speed for the hot-rod sailors is provided in this sweet little inboard craft. She is powered with a 25 hp. Crosley marine motor

ture is from in front, looking at the inside face of the transom. Every important detail which might cause a builder some concern is shown in at least *two* views, so study the drawings carefully before starting to work.

How first to start? By preparing a bill of material. This information could be readily supplied by the designer, but there's a bit of method, not laziness, in not supplying it. A lot of people start building boats before they know what they're doing. By sitting down with this SPORTS AFIELD BOATBUILDING ANNUAL before you, or large photostatic enlargements of the drawings, and by compiling your own material list, you can't *help* but become aware of the problems you must solve in construction. Compile your list of materials by ruling off a sheet of paper in columns headed: (a) Item, (b) Material, (c) Size, (d) Length, (e) Remarks.

Of course, start with the keel. And you'll see that (a) the keel is (b) of oak and is (c) 1⅛"x4", and (d) is about 11' 5" long. Next might be the stringers. These are (a) Stringers, 2 required, (b) spruce, (c) 1⅛" by about 5½", (d) 10' 3" long and (e) check the 5½"-deep dimension on the full scale lines plan before ordering. There'll be lots of notes like this one which will require a bit of checking on the full-size layout. However, the drawing may be scaled for the majority of things.

On materials, there are several things worth mentioning. When you present the list at your local lumberyard, make sure you tell the man two things. First that you are building a boat, and secondly that the dimensions under column (c) are *finished* dimensions, *not nominal.*

The white oak and spruce should be of clear, straight-grain material, free of knots or checks. All plywood (and try to obtain 16' lengths to avoid joints) should be of an accepted *waterproof* grade. Exterior-grade Douglas fir plywood or Weldwood plywood are two brands which are readily obtainable. Mahogany plywood is as acceptable as fir, but, more expensive. Take pains to specify and get a resin-bonded marine grade. It is important. All fastenings should be brass or bronze, as should all hardware. Chromed fittings dress up your boat a lot, but polished brass is as nice, and a bit cheaper.

Now, having studied the plans well, ordered your material, lofted the full-scale lines, and prepared a place to work, let's begin to make chips and shavings.

Start by duplicating the frame structures shown on the bottom of the lines plan. The full-size body plan will permit the assembly to be fabricated with a minimum chance of misalignment, and should be used for that purpose. The framing is all of ¾" spruce, and the dimensions of the bottom frames as given on the construction plan should not be materially reduced.

Carefully template the sides and bottom pieces before cutting the members from proper stock. Carefully mark the centerline on the bottom frame and the keel notch. When assembling the sides and bottoms, have ample glue and clamps ready. It is easiest to assemble the frames on the floor, on the full-size lines. Spread liberal amounts of a good glue such as "Penacolite" on the surfaces, and tack them with brads to hold them in position while the screws are driven at the chines. Follow the directions on the glue can when mixing the glue, and *don't skimp.*

The better glues, properly applied, are tremendously effective. And fastenings are often only used to hold the wood surfaces together until the glue dries. The spreader or brace bar across the head of the frames need not be glued. But check the frame for symmetry before you fasten it. Dimensions to check are from keel centerline to chine and frame head, and from chine to opposite frame head. These should be identical, give or take a sixteenth at the *most,* for proper hull alignment.

Next, fabricate the transom by fastening the half-gained framing to the ⅜" plywood planking. The centerline stiffener should be lapped over the top and bottom frames as shown. Here, too, be liberal in the use of glue, and drive the transom fastenings in *hard.* The screws from the planking to the frames should be 1" No. 8, spaced about 2½" all around.

The stem can be either of laminated strips of oak or cut from double ¾" plywood. It is best to template the stem carefully from the lines plan, making it extend to the floor line, as shown.

ONE more item must be cut, and then the erection of the frame structure can begin. That single remaining piece is the keel. This is shown on the drawings as oak, 1⅛"x4", which seems, to some, a bit heavy. The main reason for this is that the designer considers it necessary when lifting gear, such as is shown, is fitted. If such gear is not required, and the boat will be launched from a cradle or a sling, then you can cut the depth down an eighth of an inch or so to about a scant one inch. Note that the keel is tapered from the full width specified, to about two inches, at the forward end.

When the stem and keel are fitted together, glued and bolted *tight,* ready the frames for erection. Make certain the gains (notches) for the keel are a tight fit and of proper depth. Then, on a centerline laid down on the building floor, draw

YACHT ENSIGN 16 BY 24'
GALBRAITH G-626.

EXHAUST DEFLECTOR
MANHATTAN H-454.

FIN DEBBO

STEP PADS - MANHATTAN H-802 A.
OR TO SUIT.

⅞ OVAL QUARTER GUARD MOLDING MANHATTAN H-372

RUBBER INSULATION FOR ¼"
WINDSHIELD - MANHATTAN H-493, H-49

1½" FUEL FILL, MANHATTAN H-484

REVERSE LEVER.

HATCH

LIFTING EYE.

STERN FLAGPOLE AND SOCKET
GALBRAITH G-615 24' LONG.

STRINGER.

HAND GRAB.

HATCH STRAP LEATHER.

STEM CHOCKS - MANHATTAN H-1463 - Nº 1.

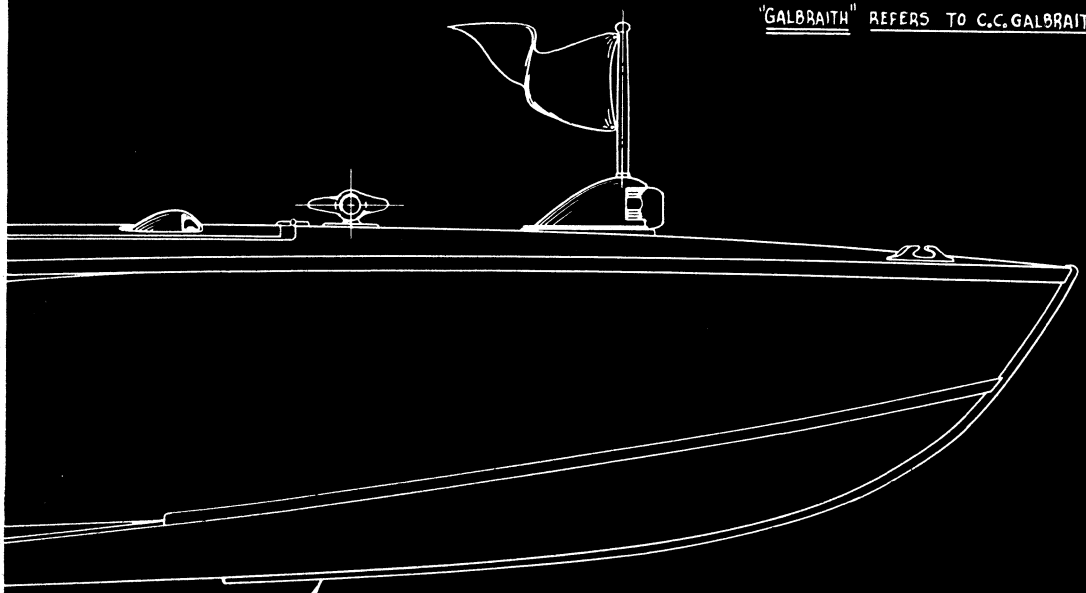
SEAT BACK & CUSHIONS -
UPHOLSTER TO SUIT.

WINDSHIELD BRACKETS
DEBBOLD 38° FIG. Nº 48, CH

"DEBBOLD" REFERS TO I.E. DEBBOLDS MARINE SUPPLY, 10366 LONG BEACH BLVD, LYNWOOD, CALIFORNIA. EASTERN SALES MAIL ORDER OUTLET - "CUSTOM CRAFT", BUFFALO MARINE MART, 1700 NIAGARA ST., BUFFALO, NEW YORK.

"MANHATTAN" REFERS TO MANHATTAN MARINE & ELEC. CO, 116 CHAMBERS, N.Y.7, N.Y.

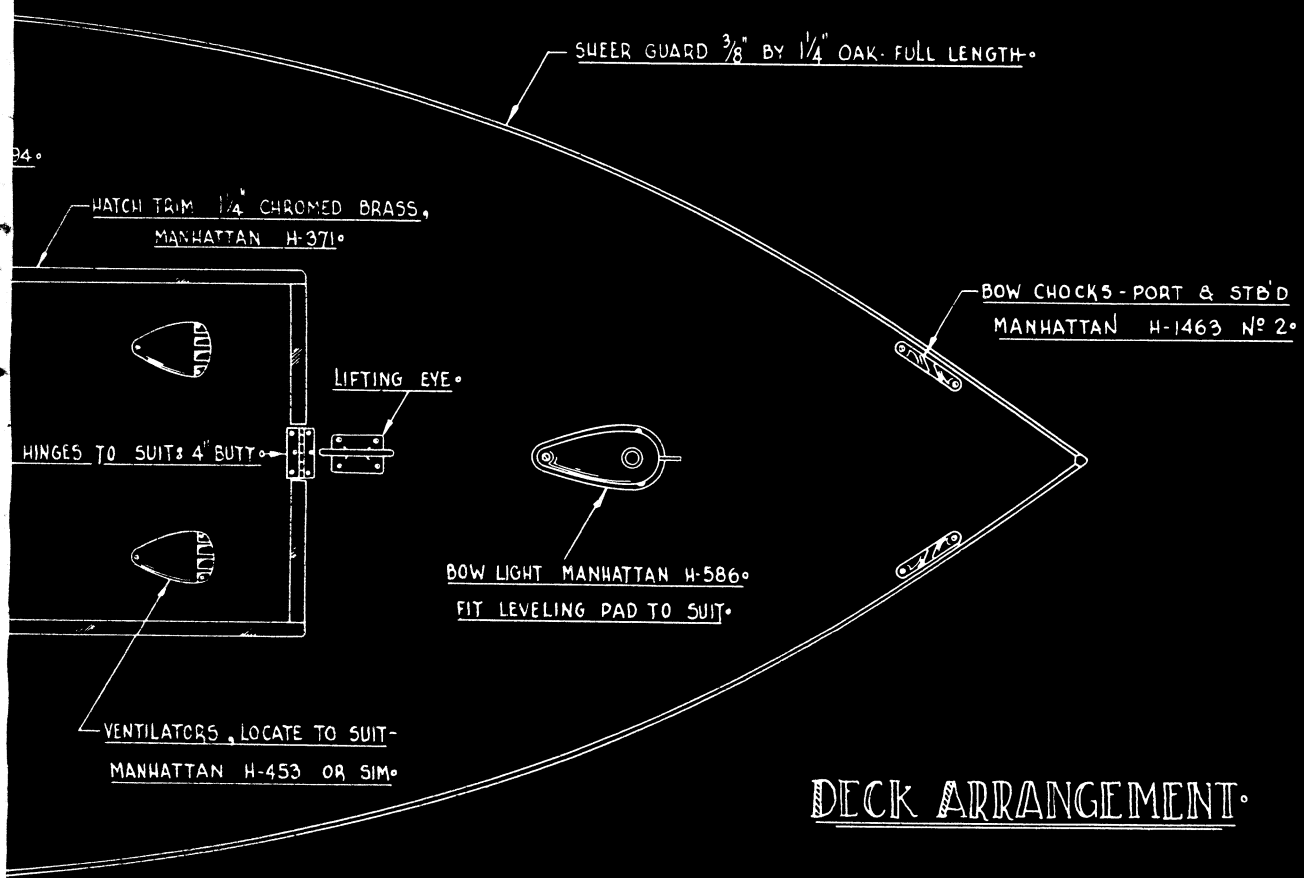
"GALBRAITH" REFERS TO C.C. GALBRAITH & SON, INC., WEST FRONT ST., KEYPORT, N.J.



TAPERED STEM CAP FROM 3/4" x 3/4" OAK WITH 3/8" BRASS HALF ROUND SIM TO MANHATTAN H-373.

OUTBOARD PROFILE.

LD FIG 47.



DECK ARRANGEMENT.

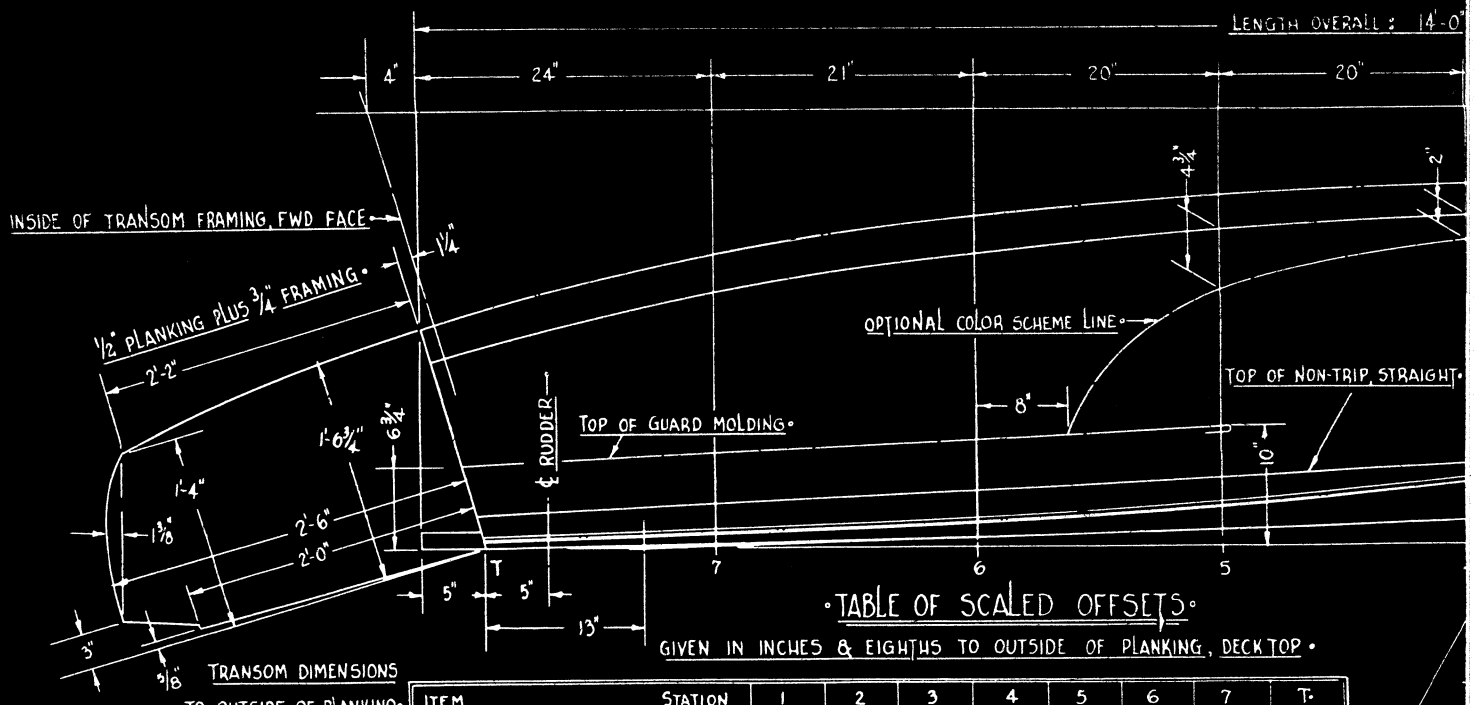
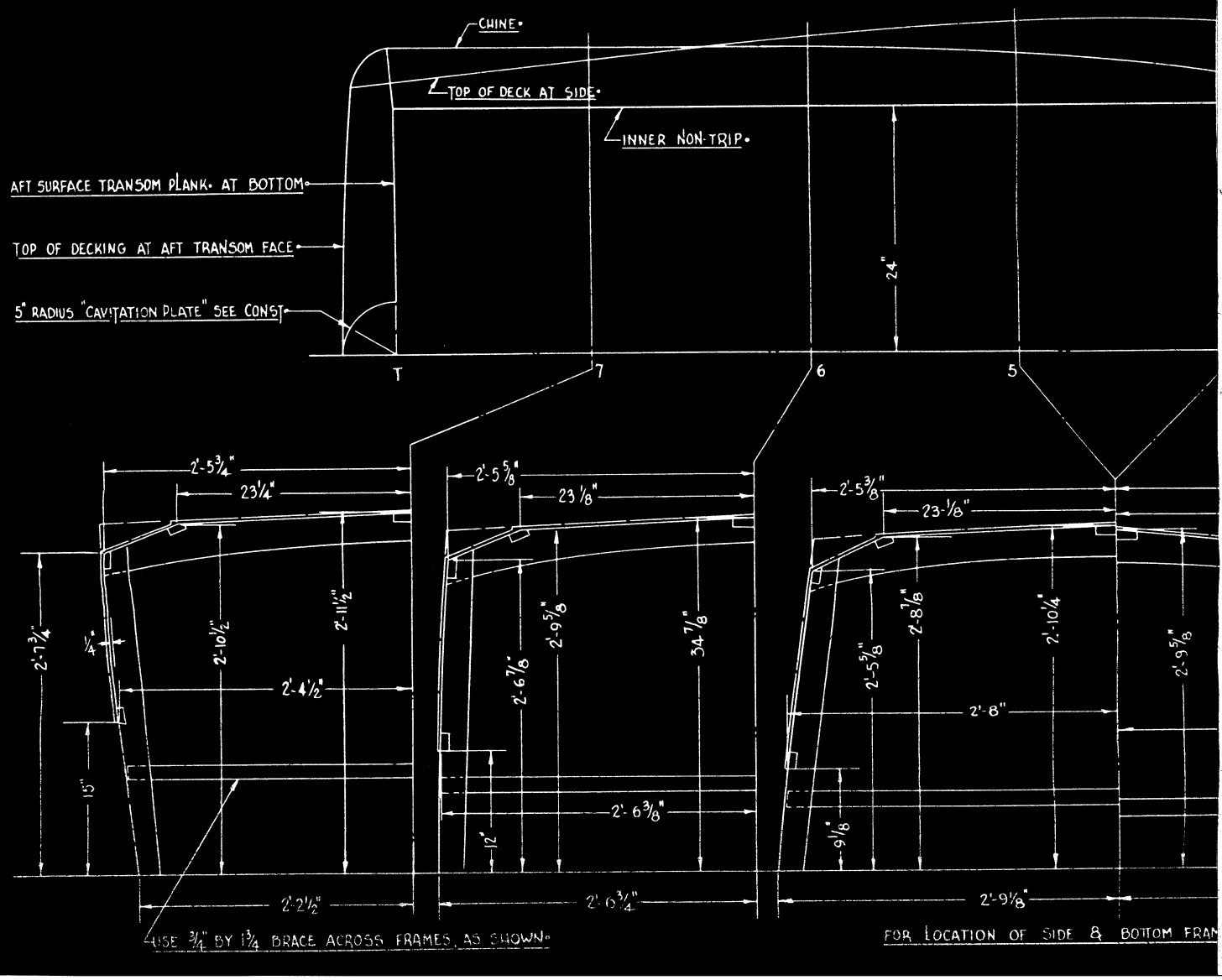


TABLE OF SCALED OFFSETS

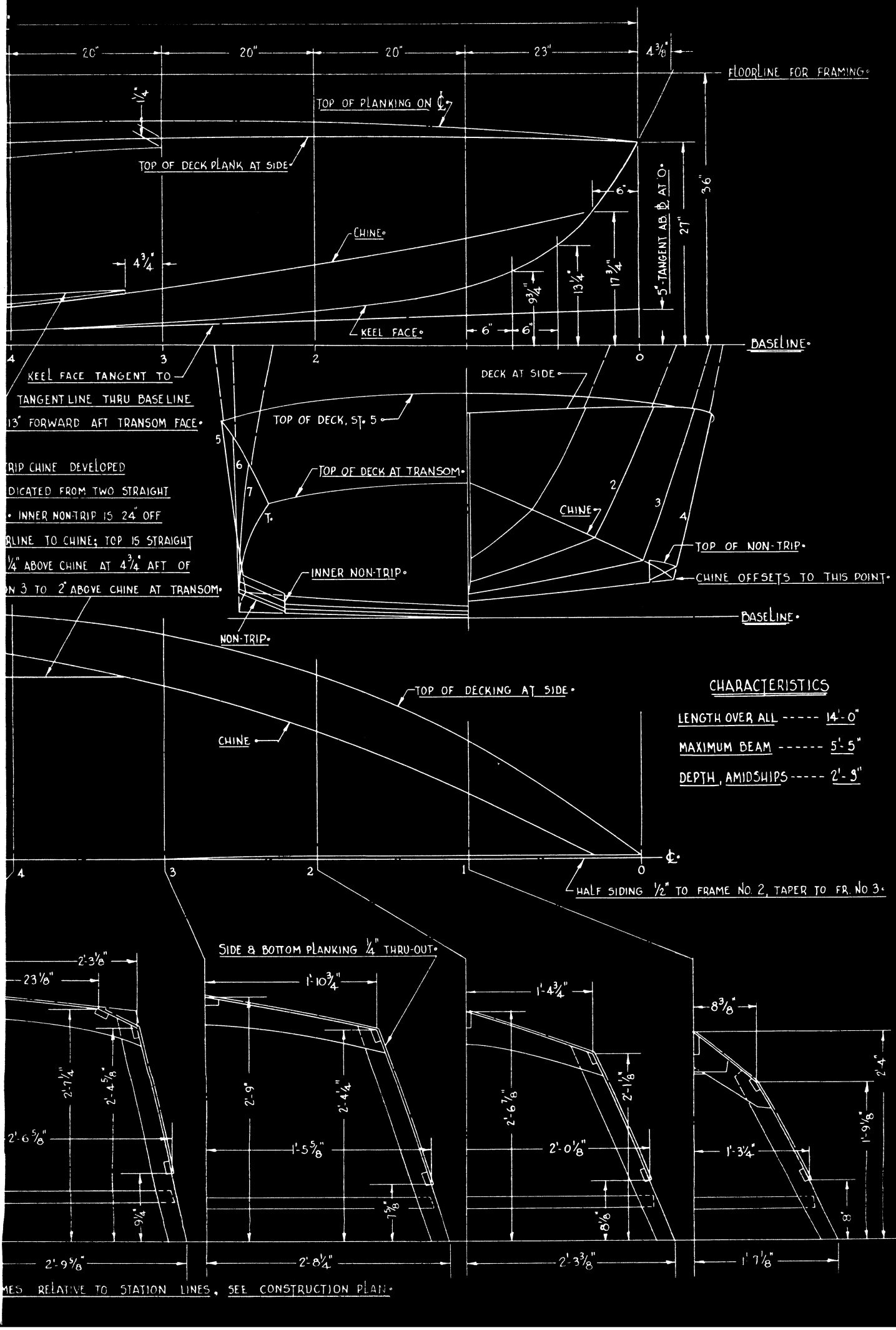
GIVEN IN INCHES & EIGHTHS TO OUTSIDE OF PLANKING, DECK TOP

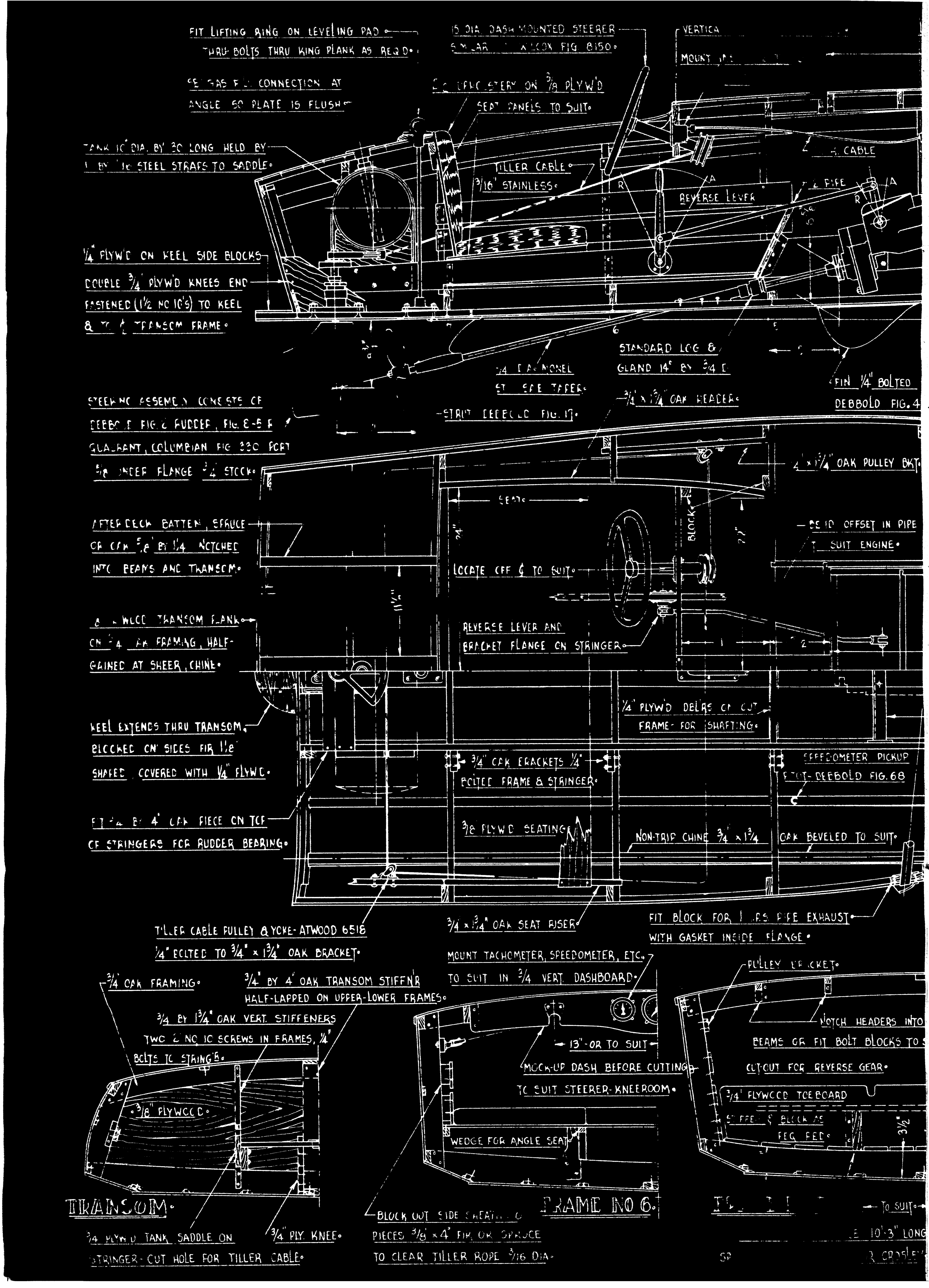
ITEM / STATION	1	2	3	4	5	6	7	T
HEIGHT: KEEL FACE ABOVE BASELINE	7-6	4-5+	3-2	2-1	1-4	0-7	0-2+	0-0
CHINE	14-1	10-5	7-5	6-1	3-2+	2-2	1-2	0-6
DECK EDGE	27-6	27-6	27-4	27-0	25-7	23-7	20-6+	15-2
CENTER OF DECK	28-6	29-5	29-7	29-5	28-6	27-1	24-0	18-0
HALFBREADTH OF CHINE FROM ℄	8-5	16-7	23-0	27-0	29-1	29-7	30-0	30-0
DECK EDGE	15-4	24-3	29-5	32-1	32-2	30-7	28 5	26-0



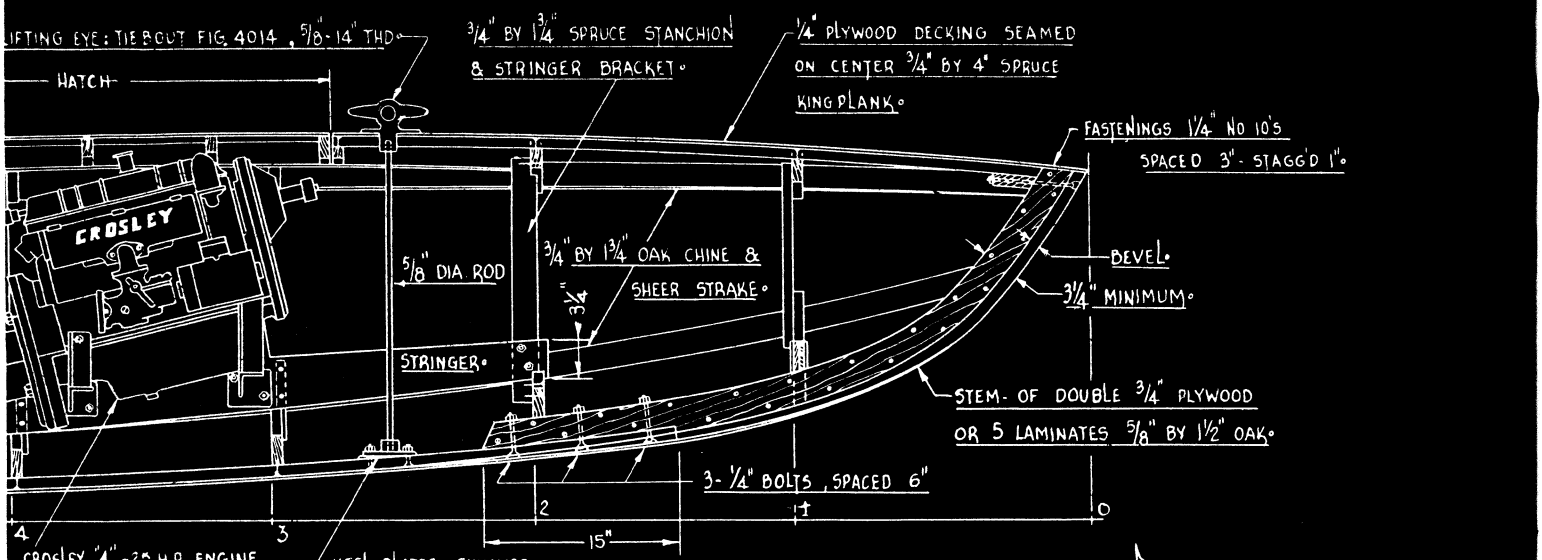
USE 3/4" BY 1 3/4 BRACE ACROSS FRAMES, AS SHOWN.

FOR LOCATION OF SIDE & BOTTOM FRA


20"
20"
20"
23"
4 3/8"
FLOORLINE FOR FRAMING.
TOP OF PLANKING ON ℄
1/4"
TOP OF DECK PLANK AT SIDE.
6"
5'-TANGENT AB ℄ AT O.
27"
36"
CHINE.
4 3/4"
9 3/4"
13 1/4"
17 3/4"
KEEL FACE.
6"
6"
BASELINE.
4
3
2
0
KEEL FACE TANGENT TO
TANGENT LINE THRU BASELINE
13" FORWARD AFT TRANSOM FACE.
RIP CHINE DEVELOPED
DICATED FROM TWO STRAIGHT
. INNER NON-TRIP IS 24" OFF
BLINE TO CHINE; TOP IS STRAIGHT
1/4" ABOVE CHINE AT 4 3/4" AFT OF
N 3 TO 2" ABOVE CHINE AT TRANSOM.
DECK AT SIDE.
TOP OF DECK, ST. 5
5
6
7
T.
TOP OF DECK AT TRANSOM.
CHINE
2
3
4
TOP OF NON-TRIP.
CHINE OFFSETS TO THIS POINT.
INNER NON-TRIP.
BASELINE.
NON-TRIP.
TOP OF DECKING AT SIDE.
CHINE
CHARACTERISTICS
LENGTH OVER ALL ----- 14'-0"
MAXIMUM BEAM ------ 5'-5"
DEPTH, AMIDSHIPS ----- 2'-9"
4
3
2
1
0
℄.
HALF SIDING 1/2" TO FRAME NO. 2, TAPER TO FR. NO 3.
SIDE & BOTTOM PLANKING 1/4" THRU-OUT.
2'-3 3/8"
23 1/8"
2'-7 1/4"
2'-4 5/8"
2'-6 5/8"
9 1/4"
2'-9 5/8"
1'-10 3/4"
2'-9"
2'-4 1/4"
1'-5 5/8"
7 5/8"
2'-8 1/4"
1'-4 3/4"
2'-6 7/8"
2'-1 1/8"
2'-0 1/8"
8 1/8"
2'-3 3/8"
8 3/8"
2'-4"
1'-9 1/8"
1'-3 1/4"
8"
1' 7 1/8"
MES RELATIVE TO STATION LINES, SEE CONSTRUCTION PLAN.

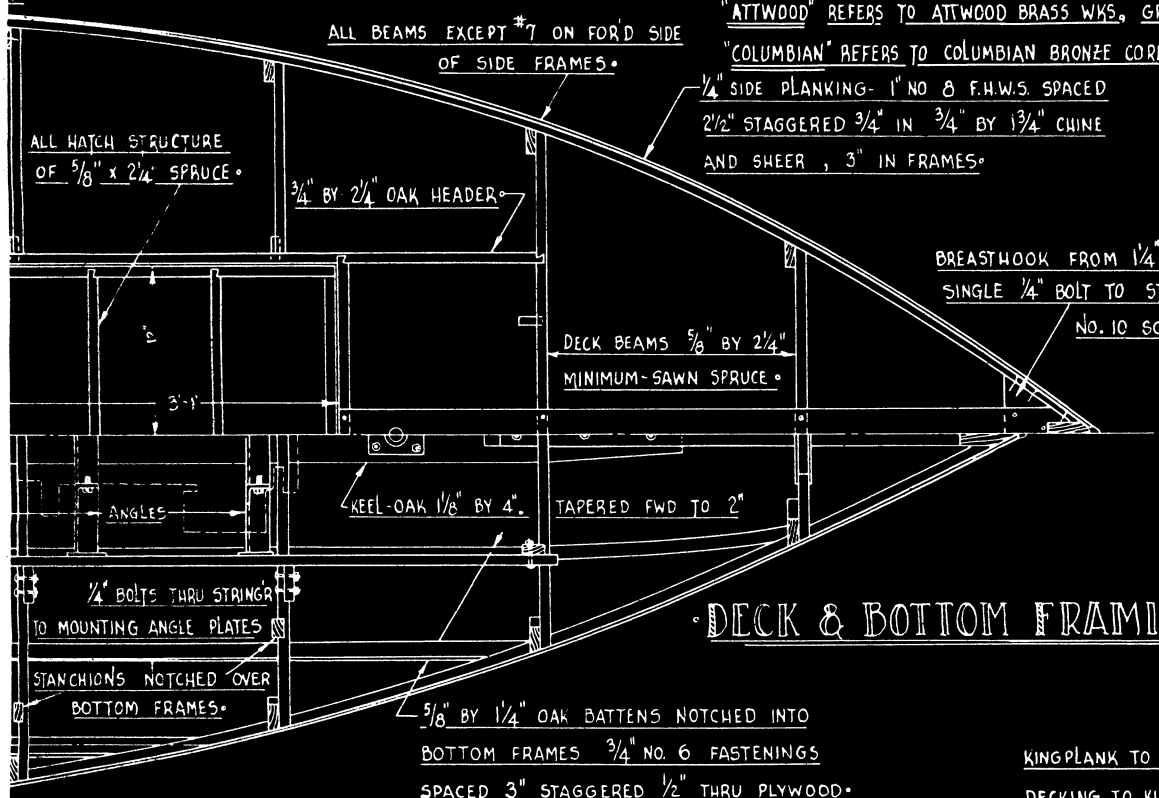


FIT LIFTING RING ON LEVELING PAD
THRU-BOLTS THRU KING PLANK AS REQ'D.
15 DIA. DASH MOUNTED STEERER
WILCOX FIG 8150
ANGLE SO PLATE IS FLUSH
SEAT PANELS TO SUIT.
TANK 10" DIA. BY 30 LONG HELD BY
STEEL STRAPS TO SADDLE.
TILLER CABLE
3/16" STAINLESS.
REVERSE LEVER
CABLE
PIPE
1/4" PLYW'D ON KEEL SIDE BLOCKS
DOUBLE 3/4" PLYW'D KNEES END
FASTENED (1 1/2 NO 10'S) TO KEEL
& TRANSOM FRAME.
STANDARD LOG &
GLAND 14" BY 3/4
FIN 1/4" BOLTED
DEBBOLD FIG. 4
STEERING ASSEMBLY CONSISTS OF
FIG. 2 RUDDER, FIG. E-5
COLUMBIAN FIG 330
FLANGE 3/4" STOCK.
STRUT DEBBOLD FIG. 17.
3/4 x 1 3/4 OAK HEADER.
4 x 1 3/4" OAK PULLEY BKT.
SEAT.
AFTER DECK BATTEN, SPRUCE
OR OAK 5/8" BY 1/4 NOTCHED
INTO BEAMS AND TRANSOM.
LOCATE OFF ℄ TO SUIT.
BLOCK
OFFSET IN PIPE
SUIT ENGINE.
TRANSOM PLANK
OAK FRAMING, HALF-
GAINED AT SHEER, CHINE.
REVERSE LEVER AND
BRACKET FLANGE ON STRINGER.
1/4" PLYW'D DECKS OR CUT
FRAME FOR SHAFTING.
KEEL EXTENDS THRU TRANSOM,
BLOCKED ON SIDES FIR 1 1/8"
SHAPED, COVERED WITH 1/4" PLYW'D.
3/4" OAK BRACKETS 1/4"
BOLTED FRAME & STRINGER.
SPEEDOMETER PICKUP
DEBBOLD FIG. 68
BY 4" OAK PIECE ON TOP
OF STRINGERS FOR RUDDER BEARING.
3/8 PLYW'D SEATING
NON-TRIP CHINE 3/4" x 1 3/4
OAK BEVELED TO SUIT.
TILLER CABLE PULLEY & YOKE-ATWOOD 6518
1/4" BOLTED TO 3/4" x 1 3/4" OAK BRACKET.
3/4 x 1 3/4" OAK SEAT RISER.
FIT BLOCK FOR PIPE EXHAUST
WITH GASKET INSIDE FLANGE.
MOUNT TACHOMETER, SPEEDOMETER, ETC.
TO SUIT IN 3/4 VERT. DASHBOARD.
PULLEY BRACKET.
3/4 OAK FRAMING.
3/4" BY 4" OAK TRANSOM STIFFN'R
HALF-LAPPED ON UPPER-LOWER FRAMES.
3/4 BY 1 3/4" OAK VERT. STIFFENERS
TWO NO 10 SCREWS IN FRAMES, 1/4"
BOLTS TO STRING'S.
13"-OR TO SUIT
NOTCH HEADERS INTO
BEAMS OR FIT BOLT BLOCKS TO
MOCK-UP DASH BEFORE CUTTING
TO SUIT STEERER-KNEEROOM.
CUT-OUT FOR REVERSE GEAR.
3/8" PLYWOOD.
3/4" PLYWOOD TOEBOARD
WEDGE FOR ANGLE SEAT
TRANSOM.
FRAME NO 6.
TO SUIT.
10'-3" LONG
3/4 PLYW'D TANK SADDLE ON
STRINGER-CUT HOLE FOR TILLER CABLE.
3/4" PLY. KNEE.
BLOCK OUT SIDE SHEATHING
PIECES 3/8" x 4" FIR OR SPRUCE
TO CLEAR TILLER ROPE 3/16 DIA.



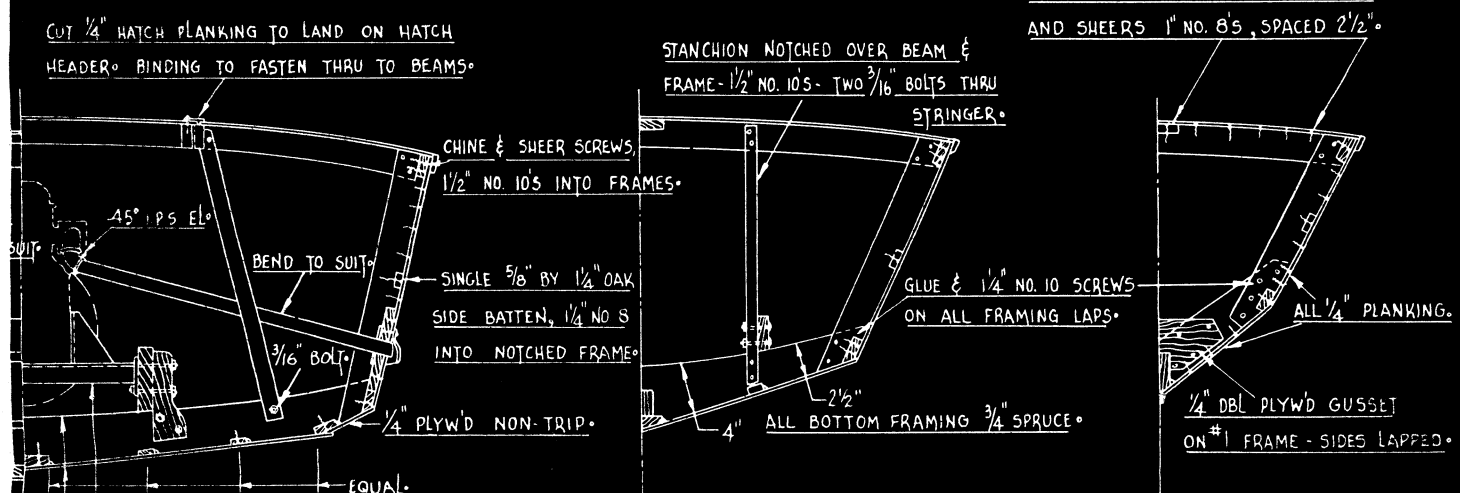
CONSTRUCTION PROFILE.

"TIEBOUT" REFERS TO W. & J. TIEBOUT, INC., 64 FRONT STREET, N.Y.C.4, N.Y.
"ATTWOOD" REFERS TO ATTWOOD BRASS WKS., GRAND RAPIDS, MICHIGAN.
"COLUMBIAN" REFERS TO COLUMBIAN BRONZE CORP., FREEPORT, L.I., N.Y.



DECK & BOTTOM FRAMING.

KINGPLANK TO BEAM: TWO 1 1/2" NO 8'S.
DECKING TO KINGPLANK, DECK BEAMS AND SHEERS 1" NO. 8'S, SPACED 2 1/2".



FRAME NO. 4.

CROSLEY ENGINE FOUND'NS TO BE ALUMINUM ANGLES 2" BY 2" BY 3/8" AND PLATE, WELDED.

FRAME NO. 2.

FRAME NO. 1.

the properly spaced framelines at right angles. Set up one of the midship frames. Number 4 or 5 is good as a starter. It must stand perfectly plumb, and be well centered. *How* you brace it in that position isn't too important. Only it should be *rigidly* braced against sidewise or fore-and-aft motion. Frames 1 to 7 should be so erected.

Carefully check, with a plumb bob and string, to make certain that the centerlines you previously marked on the *frames* are exactly above the centerline drawn on the *floor*. Then, fit in the keel-stem assembly, starting from forward and working aft.

Of course you swabbed glue on the keel notches (gains in the engineering term) in the frames, and used a single deep C-clamp to draw the keel down tightly before driving the two fastenings in each frame. These fastenings, *not specified on the drawings,* should be 2¼" No. 10, spaced about 2½". Throughout this assembly, all fastenings are driven into pilot holes drilled two sizes smaller and ¼" shallower than the fastening length. Your book on boatbuilding mentions this in detail.

You'll note that we've not mentioned the transom. This is raked at an angle shown on the lines plan. Clamp suitable supporting pieces to the inside face and fit the assembly to the keel. Glue and clamp this, too, as this through-transom extension of the keel is a potential leak source. It is well to set several lengths of cotton wicking in the notch cut for the keel. This, when properly compressed in glue, makes an effective seal.

When you've come along this far, you should stand back and admire your work. The major labor is done. The rest is work, of course, but not so tough.

When the glue has set, you can remove the clamps and get ready for the next steps. Of these, perhaps the first should be the fitting of the double transom knees. These are of ¾" plywood, and land alongside the keel and centerline transom stiffener, on both sides, notched over the bottom frame.

Next, the chines and sheer straker should be fitted. Start with the sheer strake first, as it is the easier of the two. Carefully notch, or gain, the frames with saw and chisel for these, to a depth that permits the ¾"x1¾" section to be flush with the after edge of frames 1 to 5, and with both edges of the remaining frames and the transom. This will permit proper bevels for the planking to be subsequently cut.

When both sides are readied for these members, and the sheers themselves are shaped to land on the stem at the proper angle, they can be fitted. Again the sequence is glue, clamp and fastenings, and work should progress from stem to stern equally on each side. This is to prevent the bending of the strakes from warping the frames.

The chines are similarly fitted, but provide for bevel on both the sides and bottom frames. It might be well to prepare the chines for the abrupt bend at the non-trip by wrapping that portion in burlap or other coarse fabric, and soaking them for an hour or so in boiling water. The bend will go in easier that way. Again, from bow to stern, glue clamps and fastenings.

The non-trip chines are next. These should go in as the previous two, and should fit properly and tightly against the outer chine just aft of frame 2.

Now, you'll do some bevelling. This involves fairing the frames, stem, chines and sheers so the planking will lie smoothly. Bevelling is best done by plane and file. And use several battens to see that all is smooth in every possible direction. Work on the side frames first, from amidships to aft where the change in shape is not so abrupt. Lay on the batten, noting where it does not lay smoothly along the frames. These spots should be planed, at the indicated angle, until the batten will span several frames, lying smoothly against them in a fair curve. As you progress forward, you will have to plane and file the stem as shown on the construction plan. Do this *slowly* and *carefully*. It is extremely awkward and difficult to remedy an overly zealous cut.

Follow the side bevelling with that of the non-trip chine. Note that the chine pieces themselves are well bevelled, but that the fore-and-aft bevel of the frames is almost negligible. You've got the hang of it by now, so the bottom will go with no further advice.

With the bevelling complete, there remains only the fitting of the panel battens before the planking is fitted. These ⅝"x1¼" oak strips are notched into the side and bottom frames, as shown, to reduce the unstiffened areas of the planking.

Now you can fit the planking. If you were fortunate enough to locate 16' panels, you'll have no butt joints to make, and everything will be simple. If you butt smaller panels together, the backing piece should be ½" thick and at least 8" wide to have two rows of ⅝" fastenings through the plywood.

Template the side panels with a sheet of heavy paper, thumb tacked on the structure, allowing a full half inch or more for fitting. This template can be traced onto the plywood panel and that panel run through the band saw. And that's a two-man job, at least. The plywood panels should be temporarily clamped in place to check the bevels. And if all is true, then the structure should be traced against the inner surface of the plywood. This is to aid in drilling all the pilot holes for the planking fastenings. Remove the panels and drill pilot holes for all the fastenings, taking care to locate those for the chines so as not to come through the sides. A power drill, properly stopped, will be a valuable time saver.

When all these holes are drilled, spread frame edges, sheers, chines, stem and transom with glue.

Replace the panel on the side of the boat and securely clamp it just where it was when the framing was outlined on its inner surface. Working fast, drill through the holes already drilled through the planking into the frames to the proper depth, insert fastenings and drive them home. All fastenings should be driven so their heads are just beneath the plywood surface. Work from amidships to the ends. A screwdriver bit for your power drill will be a welcome tool, as there are hundreds of screws in the planking.

WHEN the side panels are on, clean them of excess glue, and bevel them for the non-trip planking which is put on in the same fashion. This planking is, in turn, bevelled for the bottom planking. Be careful here to fit the right-and left-hand panels tightly at the centerline. Note that the bottom planking extends aft of the transom for the small built-in cavitation plate.

After all the planking is on, the next problem is one of sanding, filling the screw heads with "wood-dough" and painting with a good sealer such as Firzite.

Before turning the boat over to complete it, drill the holes for shafting and rudder stock.

Now, the boat should be unfastened from the floor and turned right side up to rest on a suitable cradle or chocks. This will permit the trimming of the frame extensions and the side planking above the sheers. Then attention should be directed to the two stringers. These rest on the frame tops and are bolted thereto through oak brackets. Stanchions at either end tie the stringers to the transom and to the deck, as shown. The location of the stringers will depend on the engine used, and you should look into this as soon as your engine choice is made. While the Crosley requires a foundation about as shown, most marine engines are mounted on heavy wooden pieces bolted to the stringers. Your boatbuilding book describes that in detail.

On the stringers go the tank saddles, rudder bearing support, seat wedges and seat panels. However, there is still deck structure to be fitted, but this needs little explanation, as the drawings are amply clear on this score. It might be well to fit the engine *before* making the hatch, as the hatch shown is rather large for certain engines.

The gas tank, of 14-gauge plate should be fitted with vent and fill lines and a line forward, having a shut-off valve as close to the tank as possible. The tank should have at least one baffle plate.

Hardware goes in fast, as do all the remaining items such as floorboards, side sheathing, decking, and seats. While the hardware specified on the drawings need not be used, you should get fittings of about equal quality. Details of the clutch and throttle controls depend on the engine used, as does the location of water inlets and plumbing. Follow the manufacturer's suggestions on these, and also his propeller recommendations.

Paint and upholster to suit your own whims and you'll have a boat which demands champagne for the launching.

Mucho Gusto, if properly treated, will provide you with pleasurable hours many times over those you spent on her construction. Take care of your boat, and its engine, and you'll enjoy every minute you sit behind her *wheel.*

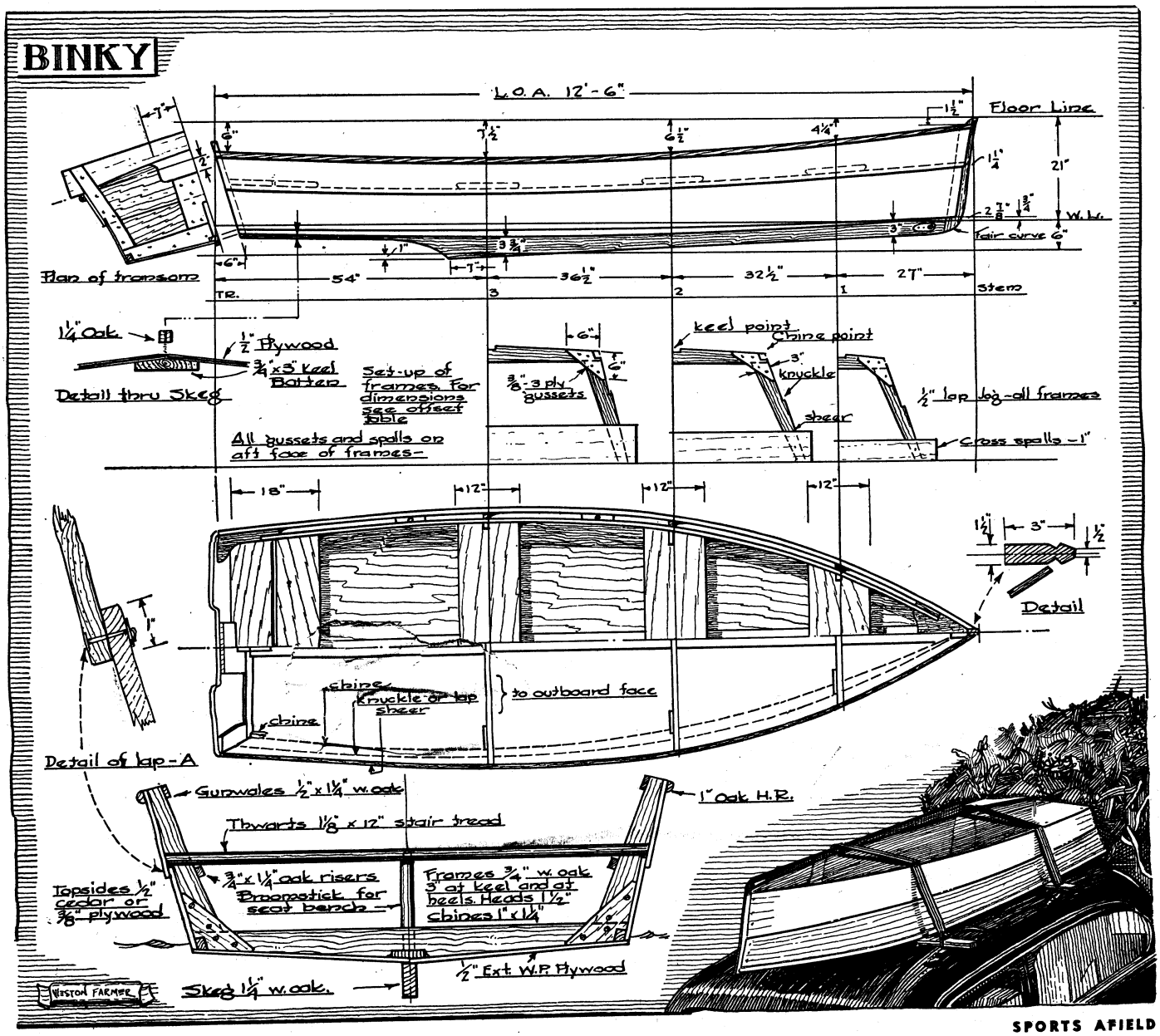
Mucho fun!

BINKY – an all-around tender

By ***WESTON FARMER***

Added pleasure in gunning or fishing on your next cruise can be yours with this specially designed little craft. She's an excellent beginner's project

Below are the lines and measurements for the hull shape of Binky. The essential outlines must be laid down full size and faired up before frames can be assembled. Note that the cross-spalls are as wide as the distance from shop floor to sheer line.



ANY NAVAL ARCHITECT will tell you that a good *small* boat is much harder to design than a good *big* boat. The reason is obvious. To be good, a small boat has to meet a greater variety of compromises. She will be used more ways for more reasons than will a larger vessel.

This fact has just been brought home to me. An 80-foot steel tug designed for a Canadian pulpwood outfit took less preliminary sketching time than Binky here. This will give you a clue to how much trouble it is to work out something *good* in the small boat line.

Now a dinghy is toughest of all small boats to design. She must be dry in a sea; she must be good under oars. She must be light to tote well. So that, if her parent ship is large enough, she can be hauled aboard and snugged down. Rowing boats do not as a rule tow well. A dinghy must do all these things, and be boss of the situation if a kicker is used. Gunning and fishing and gunk-holing add much to the pleasure of using a larger boat. And the dink, like a good wife, makes a team of your whole outfit.

I think this Binky design answers the correct set of prayers. Outwardly she looks like a million other skiff models. Skiff plans appear like dust in the Milky Way. Flat skiffs won't tow well if they row well. If built of plywood they are rubbery unless lap-seamed.

This boat is flat enough to tow well, enough rocker to row well and is helped by the cutaway skeg. There is a little dead rise, which is magic but critical stuff. It works wonders for boat feel only if you know how to use it.

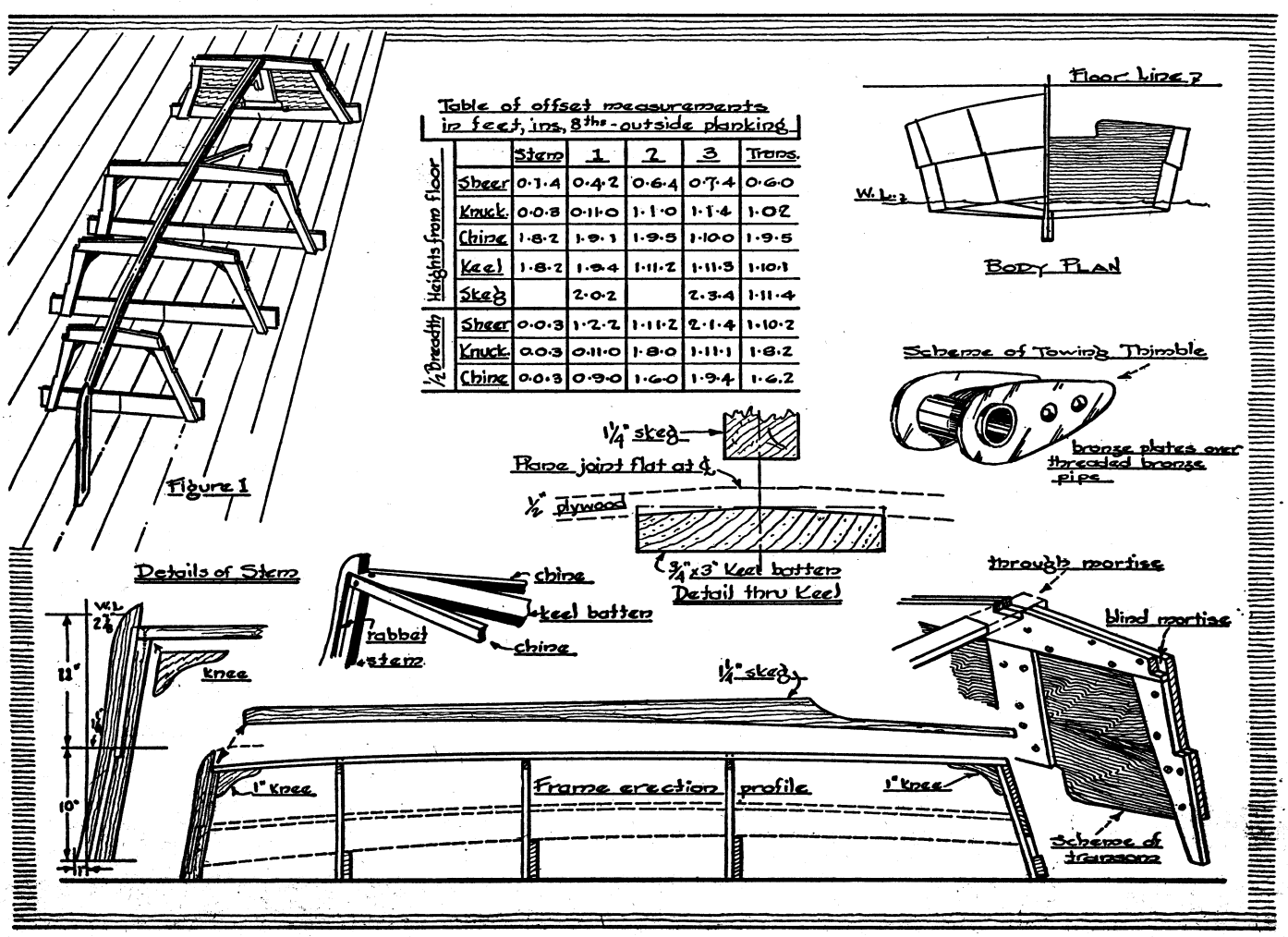
As shown in Fig. 2, flat-bottomed boats have no lateral plane to speak of, and they roll a blanket of water under them when towed. They slide off and yaw, while the boat with dead rise *gets in the groove* and stays put.

A dinghy must have some trail—yet too much brings her to a yaw, especially when towed by the stemhead. But that's a wrong practice anyhow, and results in a yawed path. Binky is quite the cheese in all departments! She rows well; is big enough to be a real lifeboat in case of fire or foundering. You can place the four thwarts to allow one person, two persons, three, four, five, six or seven to be carried with the load balanced. This alone makes her different from seemingly similar craft.

Binky is light, and a car-top heave ho is easy. She has no bad traits, many virtues, and I am glad to recommend her as something any man or boy can build from materials obtainable almost everywhere.

She favors, of course, the small outboards—2 hp and under, being

When you have faired up the body plan, using the table of offsets for measurement, your floor drawing will look like the Body Plan at upper right. Frames are then set up according to the perspective sketch. Details clarify tow thimble, cutting of stem, keel.



especially good with the little malted-milk mixers like the Elto Cub. She planes with 4 hp and even as a speeder she is good. She is planked with ½" plywood on her bottom. The chine pieces are 1"x 1¼" mahogany or oak—some wood which will swell, but will hold fastenings. Her frames are of ¾" white oak, 3" deep over the keel batten, 3" molded at the heel and which taper to 1½" at the frame heads, or wales.

For the topsides I nominate ½" white cedar, with white pine second choice. And if you can't get sufficient widths of these, then use ⅜" plywood, lapped just as shown. Do not use one panel of plywood for the topsides. One-hunk topside panels usually give a "rubbery" boat, in this breed of cat.

Binky's keel batten is ¾"x3" white oak, though I suppose mahogany or spruce would work quite as well. The frames are gusseted with ⅜" waterproof plywood, glued and screwed to the aft face of the frames. The seat or thwart risers are of oak, ¾"x1¼". The wales are ½"x1¼" white oak. The transom is ¾" white cedar preferably, but mahogany can be used, though it's heavier.

Her stem is 1½"x3" white oak. It needs to be, because the rabbet and fairing to a ½" stem face eats out a lot of wood. The stem is "fortified" by a 1" oak knee, and a 1¼" mahogany, birch or apple breasthook. A 1" knee is used at the transom.

Thwarts are 1⅛"x12", of some light wood, thick for stiffness; 1" boards here will spring badly with two people on a thwart. I have used and recommended a broomstick bench under the thwart, doweled into the seat. A great stiffener—eliminates panting.

The oak skeg is cut away as shown. Done this way, it aids rowing maneuverability, and ditto under power. This member is sided 1¼". Might be a good hunch to round the piece at the forefoot, taking away the square edges, and thus avoiding shredding when beaching, and giving a less wet entrance when towing.

Those are the materials we use for Binky. Now for the building method.

First, of course, you lay down the lines full size, using the measurements given in the table of offsets. These offsets read in feet, inches and eighths. Errors creep in to the most careful scaling of any drawing, especially those done to small scale. Sometimes a whole column of dimensions gets under the wrong heading. Fair the boat full size, and work from the full-size layout, thus discovering errors in advance.

When you get the body plan drawn up, "diminish" the frame lines by ½" on the bottom to allow for the thickness of bottom planking. Diminish the topside frames by the thickness of that planking, and allow for the knuckle, or lap jog.

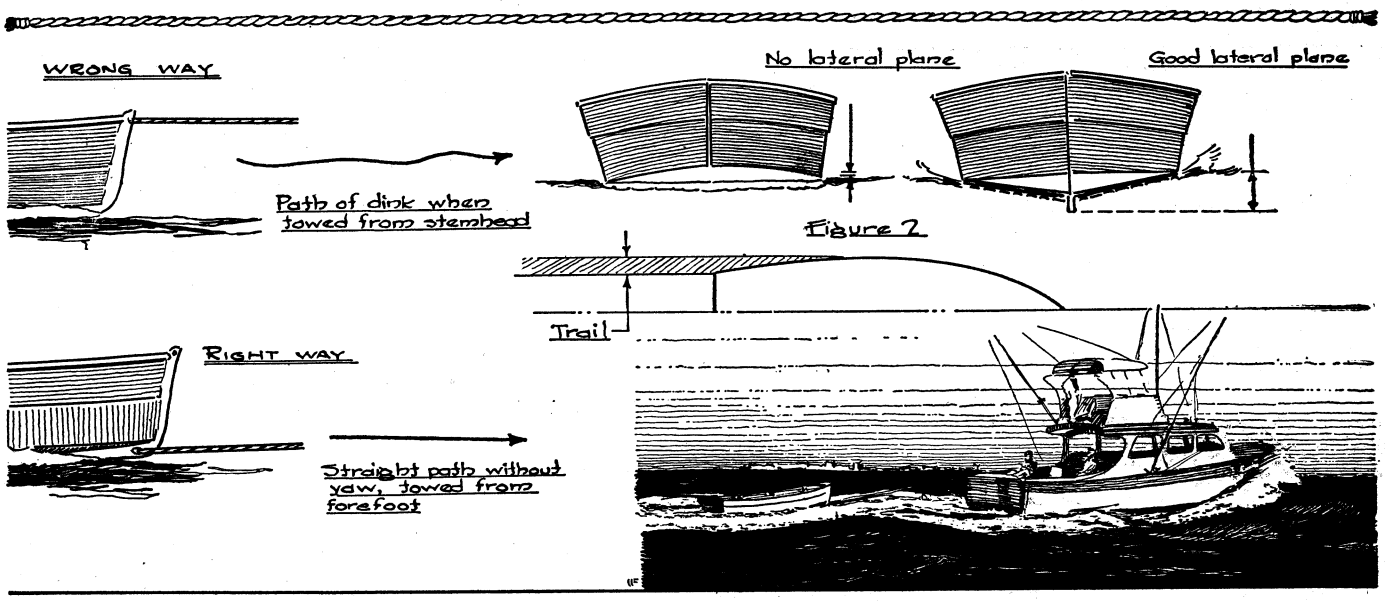
Glue and screw on the gussets on the aft face of the frames, and tie the head ends of the frames together by cross-spalls fastened temporarily with screws. Since Binky is such a smallie, for cross-spalls use scab lumber of sufficient width to meet the distance between floor line and sheer. This is handiest—the spalls will extend from the frames to form plank edge landings when streaming the strakes, and the spalls can be toenailed to the shop floor. If you build in a basement or garage on concrete, lay two planks on the flat for a floor. When set up, squared and braced—plumbed and horned as boatbuilders term it—your frame will look like Fig. 1.

Next the ¾"x3" keel batten is socketed on the stem, tapered to accommodate the impingement of the chine pieces, and is bent for its length into the socket in the transom. This is a *through* mortise, and the *only* one in the transom. The chines are blind-mortised.

Now fasten the chines in, using appropriate sized screws—about 2" No. 12fh on each frame, and 1¼" into the stem. You are now ready to plank the topsides.

The broad topside strake from chine to knuckle is spiled for shape. Use a stiff cardboard or thin plywood template for this. It will give you the true expanded shape of the plank; ½-inch cedar boards are best for topside planking. Mahogany will also be good. If you must use plywood, use ⅜" exterior *waterproof*

A dinghy should not be towed from the stem head. The right way is to tow from the forefoot. This takes the yaw out of towing. A boat with adequate dead rise has more lateral plane than a flattie and will follow better. Figure 2 explains meaning of "trail".



type, and use care in lapping the seam. Don't put plywood on in one flat on Binky's topsides: the one-hunker will pant like an oilcan. Lapped seam is needed for stiffness, strength. Use 1⅛" copper clout nails about 1¼" centers for fastening the top strake to the overlapped lower plank.

Copper rivets over burrs are even bettter if you can get them. Use No. 14 rivets and nip off excess end material with snub-nosed nippers before heading rivets over.

No seam sealer, gunk, or bedding compound has to be used on ordinary wood lapped strakes. Professionals don't—they know that any piece of wood nicely fayed against another will use the wood's natural tendency to gleet up and become tight when wet. Such a lapped joint, on cedar, mahogany or pine, can be repeatedly soaked tight, and is the chief blessing of a lap-straked hull. A gunked seam or a painted one will sooner or later find the compound *perished,* hence hard and cracked, and then virtually impossible to keep tight or repair.

Fasten the strakes to the stem and chines and transom with 1" No. 8fh brass or galvanized screws on 3" centers along the chines, half that spacing at stem and transom. Now you are ready to put on the bottom.

This is a piece of 4'x12', ½" exterior type *waterproof* fir plywood. Saw the panel into two equal halves, 2'x12', and lay them over the bottom, centered along the keel line. Lay a batten about 1" wide over the seam at the centerline and scribe both sides of the batten. Remove, saw to line, and trim so that the panel edges mate nicely in a seam along the keel center.

Now tack the panels down temporarily and scribe along the hull edge for the shape. Saw this out with a ripsaw or on a band saw, leaving plenty of stock for planing to a neat joined finish at the chine edge. This panel, because it is plywood, which *doesn't* swell up, should be bedded with Kuhl's bedding compo, or other good bed such as Dolphinite. This bottom piece, being outboard and screwed in place, can be easily removed for rebedding and repair.

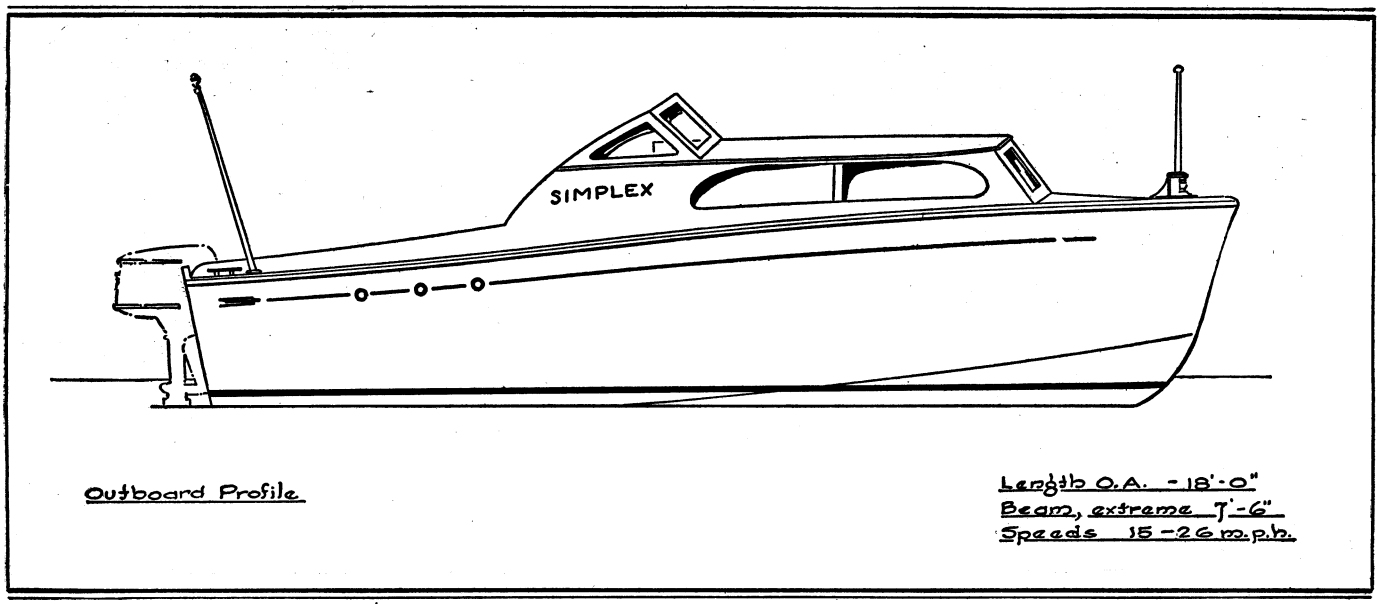
At this stage, sand the exterior of the hull well, and prime with two coats of Firzite, which you can get at lumberyards. This is a sealer and a grain-hider, eliminating grain showing through paint. When the hull has been primed, saw through the transom frames at the sheer, also at No. 1 and No. 2, leaving the midship spall alone. Remove spall toenails, then right the hull and install the wales, risers, 1¼" breasthook and transom knees.

Preferably, use redwood or spruce for stern sheets and thwarts. These should be 1⅛" thick. A good dodge I have used is to make thwarts of fir stair tread. But this stuff is very heavy, and should be run through the planer to 1 1/16" thickness. Don't forget the broomstick panting posts. Next get out the 1¼" white oak skeg.

Cut this away aft exactly as shown, and she'll both row well and tow well for you.

Fasten in the rowlocks at points shown, boring for them through the oak you will use. Fasten the oak rowlock blocks through wale and half round molding with 2" No. 12 screws. Galvanized rowlock sockets, and *open* (not pinned) oarlocks should be used on 7' leathered spruce oars. Avoid the oarlocks with fixed pins through them. Reason: you cannot choke or feather your oars, essential for safety in a wind.

Install the towing thimble in the skeg near the forefoot. Now paint the final coat, and you've got an unusually versatile and competent dinghy.



SIMPLEX — A MILITARY TYPE OUTBOARD CRUISER

She is built of plywood, and will build for slightly over $200 for materials

By WESTON FARMER

UP IN THE lake states where outboard motors are made—Wisconsin, Minnesota, Michigan—you'll find a bewildering maze of waterways ideally located for intriguing cruising. On these waters it either blows like sixty and everyone stays ashore, or it doesn't blow at all and everyone and his brother goes afloat. For such water and service was *Simplex* designed.

She is boxy and big for her inches. She is as simple as possible to build, giving consideration to strength and the whopping loads that craft of this type are asked to carry.

Simplex is not the last grunt in speed, nor exactly the kind of boat for open water. On these points I'd prefer *Sun Dance,* the forerunner of *Simplex,* which appeared in last year's *Boatbuilding Annual,* a few copies of which are still available.

But when it comes to breezing off the girl friend, or taking out a pack of kids in calmer water, *Simplex* will provide the passenger-carrying bulk you need. She is contemporary in looks, and should please the Neo-Whistler or Hot-Diggety school of boating advocates, for I have borrowed something from my PT boat designing experience and have given her something of that military persuasion. She is a good all-around boat; simple and cheap to build.

Simplex is one of the few designs that can handle twin engines if need be. She will handle two 15 or two 25 hp outboards with ease, although she'll be quite lively with one of either.

One reader of last year's *Boatbuilding Annual* built a *Sun Dance* for $198.50. *Simplex* will cost only a few bucks more, this extra cost being chiefly in the Plexiglas for the cabin lights.

You'll need ample space in which to build her, as the 14-foot forward topside plywood panels are "wung out" very wide when fastening to the stem, bending through approximately 43° of arc.

This will take space, and more than one pair of hands. This bend is wide and reasonably easy, but will take some doing. But it is being done every day, and the lines of *Simplex* have been generated on the developed surface principle from transom to frame No. 1 to make bending easy.

Forward of that point, her lines depart from purist theory, and a faint tuck is taken in her topsides to give the PT boat stem profile, now being ardently copied by some hull draftsmen.

Building outdoors is feasible if you use a six dollar Koroseal car garage covering, particularly in the dry season. Rain spoils nice surfaces and joints. Rain also knocks mating surfaces cockeyed, making it hard to get a tight hull. But aside from these few pointers, there is nothing unusual about *Simplex*—except her simplicity.

Her arrangement plan has been purposely left wide open. You can do what you wish about running seats, stove, lockers, and whatever suits you. Any man who can plane a smooth surface and who has an eye for a fair curve can easily build her. But wood choppers had better

leave this — and any other boat — alone.

The beginning step in construction is to lay down her lines *full size*. This means outboard profile, half breadths, and body plan. All must fair up and tie in on your loft floor before you cut a single stick of wood, or you will get into measurement trouble.

The profile must be in *fair* lines as reasonably close to the heights above baseline as is feasible with your batten. The half breadths also must be *fair,* and the body plan drawn off these two views must check for beamwise and heightwise intersection before you cut a single stick of wood.

A boatbuilder doesn't need to be told this—he understands why. But some amateurs think they can lay down a body plan only, from offsets, and commence construction.

If a big enough painted floor is not available, you can tape pink building paper to the floor in a couple of lengths with sufficient overlap to give you a good laying-down surface. Snap the baseline and the waterlines in with a chalkline; there is nothing more accurate.

Take a straightedge and pencil in this set of lines. Carefully erect the perpendiculars on the baseline for heights, and off the centerline for half breadths. Make sure of neat station spacing as dimensioned. You will need two battens to loft this boat. One should be 1"x1"of some knotless wood (sugar pine is ideal; mahogany good) and should be tapered for about 6' down to ¼" at the end. This is for lofting in the sweep of the sheer line in plan view. An untapered batten will tend to give a "flat" just abaft the stemhead. To avoid this, the sheer line has been drawn extended. This whole line should be swept in, working well back on the batten.

A small batten of oak, about 3/16" on the flat and ¾" wide will do to fair in the stem profile, being streamed between nails set on either side.

All the offsets shown have been scaled from the original drawing from which the illustration is printed. These have again been checked with the scale model which was made to check flotation and hydrodynamics. They are believed to be accurate. But errors sometimes occur. Once in a while the right dimension gets into the wrong column, and so on.

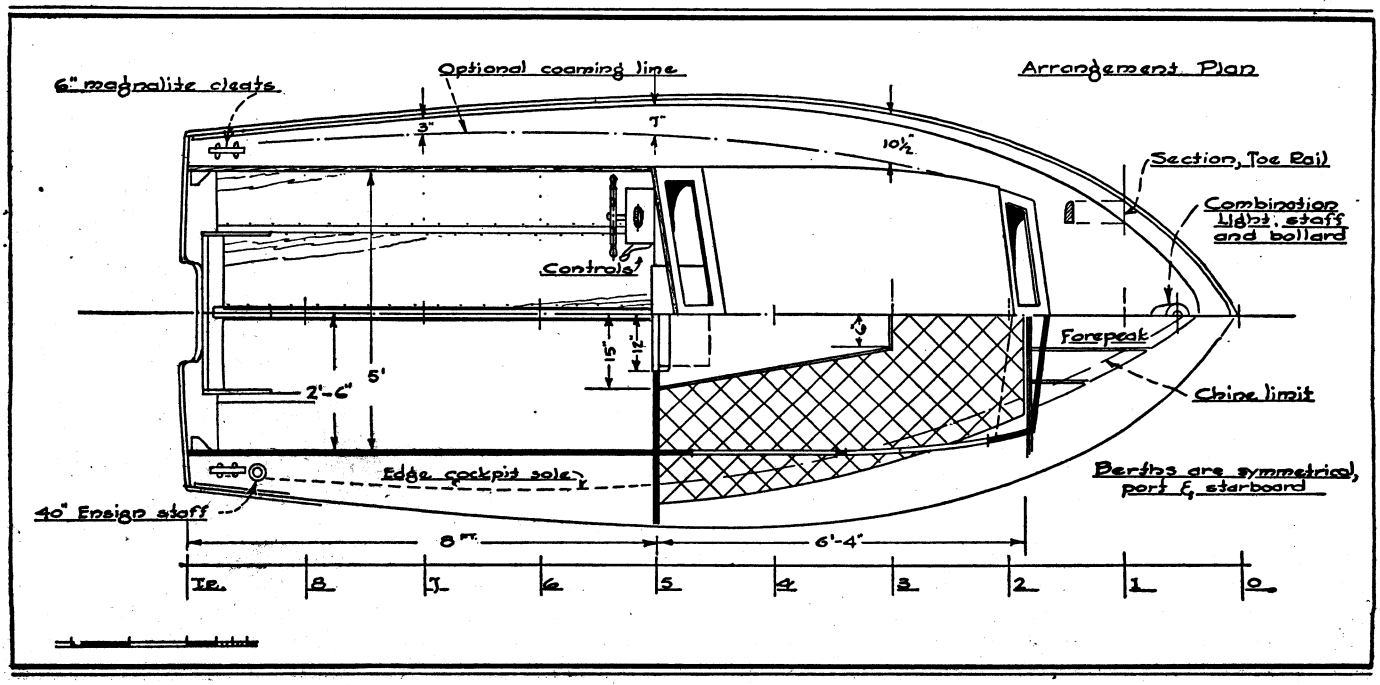
The idea of laying down is to fair all lines closely to the offset table. Don't get into a panic if an offset is wrong. Ignore it. Then average the dimension in from the sweep of batten from other points. *Simplex* will float all right and run entirely all right if you'll do this.

On the body plan, you will note that most of the frame sections are straight. This is part of the *Simplex* idea. Plywood, however, when bent and warped will belly somewhat. The idea is to *let it.* I have indicated this probable bellying at points where the model indicates it occurs. And here we have a gimmick.

Frame these sections perfectly straight when you loft them, and build the frames straight section. Where a belly is indicated in the bottom lines, you can, when initially bending the plywood over the boat's frame for size, determine the amount of natural plywood belly. Add curved shim frames to pad out the curved contour. Screw and glue these shim frames to the main frames, and your problem of lofting a curved or developed surface is solved.

The reverse process is employed on frame No. 1 where that tuck in the topside bow panel will call for a dished-in frame. You may trim out the required hollow with a spokeshave from the solid according to requirements of the bent panel. But it would be much easier, it seems to me, to build the topside frame on No. 1 about an inch shy of full, bend the panel to the sheer harpin and chine, and, after it is secure, and the hull turned over, add shim pads. Their size and bevel can now be

The deck arrangement plan of Simplex is shown in the upper half of the drawing. Note that if more cockpit space is wanted than the plan shows, an optional coaming line is given. Lower half shows layout of the extremely simple arrangement plan. How does this suit your requirements?



easily determined by scribing.

Extend all frames to the floor line indicated on the body plan. The end of the frame that hits the floor is called the "heel." Tie the heels together with 1"x4" cross spalls of rough lumber, carefully marking the centerline on the cross spall.

Because the body plan is drawn to the *outside* of the planking, the frames must be built ⅜" *inside* the sectional line to allow for planking thickness.

All planking of *Simplex* is of ⅜" DFPA-Ext. grade, which means marine plywood, and good two sides. Nothing else will hold together.

If you are fortunate enough to live in an up and coming locality where complete stocks of plywood are kept, you can get marine plywood in the required lengths. You will need two pieces ⅜"x4'x14' and one piece ⅜"x4'x12' for the topsides. This latter piece will be cut in half, so two pieces ⅜"x4'x6' will do, and may cost you less.

For the bottom you will need two pieces ⅜"x4'x14' and one piece ⅜"x 4'x10'. This latter piece is also cut in two. Maybe your dealer has two five-foot lengths—they'll do. All of this is marine plywood, remember.

If you go to twin engines and the boat is to take a beating, and you want an especially long-lived job, buy five-ply for the forward bottom, ⅜" thick. This is airplane grade, birch-faced, and expensive. But if you've got money enough for *two* motors, you should worry.

An alternative would be to coat the bottom with glass cloth if severe service is intended, using ordinary DFPA-Ext. ⅜", 3-ply.

The gussets for the frames are of ⅜" 3-ply, glued and screwed both sides of the frame with No. 6 ¾" flathead brass screws. If you can't afford brass, you might go to cadmium plated screws. But my experience with such screws has been that they rust out in a few years. Brass, especially Everdur screws, are long lived.

A good source of screws, if you must order by mail, is the Southern Screw Company, Statesville, N. C.

All gussets are glued with casein waterproof glue, made in small batches and used fresh. Where indicated, the gussets are left open. Otherwise they are filled with lumber molded same as the frame.

The setup of the frame is the same as for any of the plywood boats discussed elsewhere in this *Boatbuilding Annual*. There is no need to rehash the obvious about that subject here. Just make a grid on the shop floor, erect the frames to the floor line, fasten up the keel and the stem to the frames, properly plumbing and horning them, and you can then install the chines, and the sheer harpin and clamps and get on with the planking.

A word on the harpin might be well, as you don't often see this typically heavy boat feature on so light a craft. I use it here because whenever a big boat shop has a yacht with bent and sawed frames which have a lot of flam to them, a harpin is always put on the molds to secure the frame ends to.

Most harpins are female, cupped to fit the flam. Here we reverse the procedure, and this flat shelf, or harpin, is band-sawed after being edge-scarfed. The drawings tell the tale.

I'd use mahogany for this member, or yellow pine (if you are careful about driving fastenings) but not oak, which would call for expert woodworking. Note that the harpin ends after its purpose of holding the shape of sheer sweep is over, and an ordinary sheer clamp is jointed and bolted to it, finishing out the sheer edge to the transom.

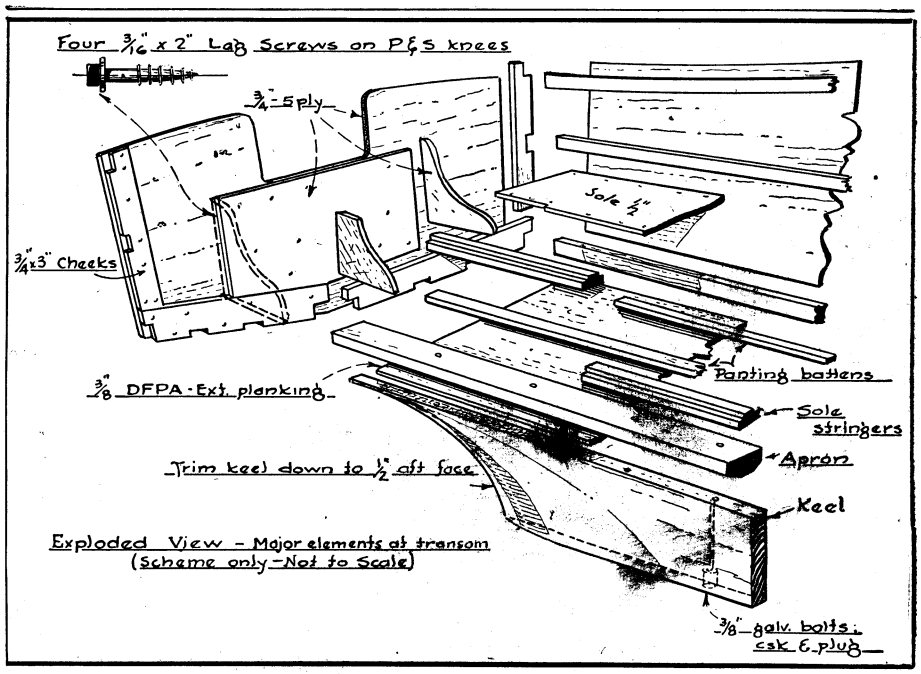
The drawings clearly tell the story of the subsequent construction, and you will see perspectives which are done to save a whole lot of words.

The cockpit sides are shown parallel, but an option is shown dimensioned if you want the extra room. The parallel cockpit sides will go in like greased lightning, and the resulting cockpit space will be 5'x8', which is larger than the standard small bathroom! The side decks then give nice cover room for multiple cabinets and drawers—something no boat can have too many of. In this parallel coaminged job, only the ends need bending. Boil them in a washtub for 15 minutes, bend them over a form, and horse them home with bolts through the harpin. Handy thing, that harpin!

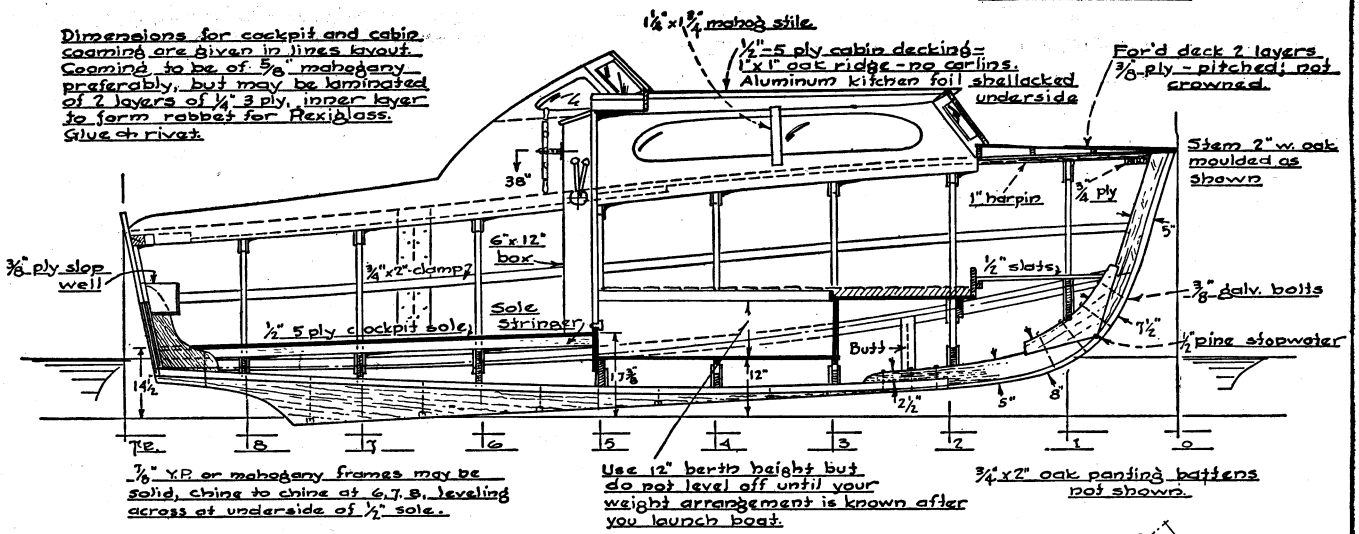
I'd use ⅝" mahogany for the coamings. It will be cheaper to cut the window lights out with a band saw from the solid wood than to burn up time making a mullioned and stiled frame. A way of inserting the ⅛" Plexiglas lights is shown.

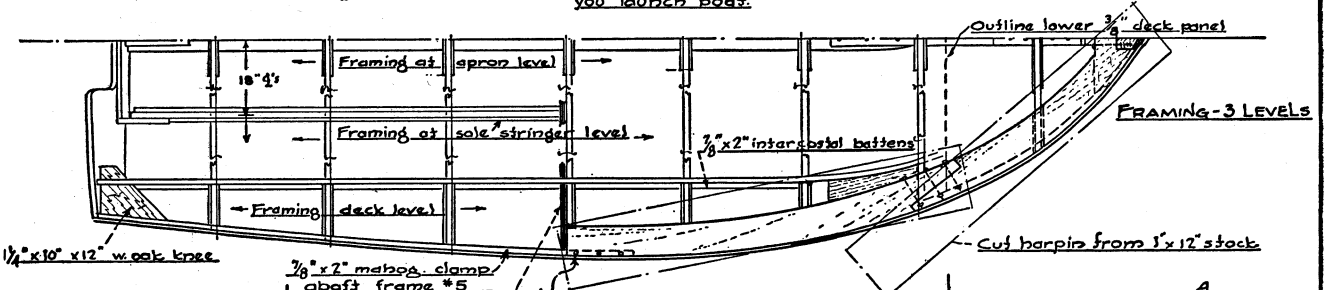
You can take the panels to a sash and door factory and have them rout out the recess rabbet, or you can back the entire port area with the Plexiglas, and try your luck at cementing it to the frame, using a fillet of something like Sealer 900 or Kuhl's elastic seam compo to keep it tight. I have not shown swing windows forward, in keeping with the *Simplex* idea, but they will without a doubt be wanted later. What's the matter with hinging the Plexiglas

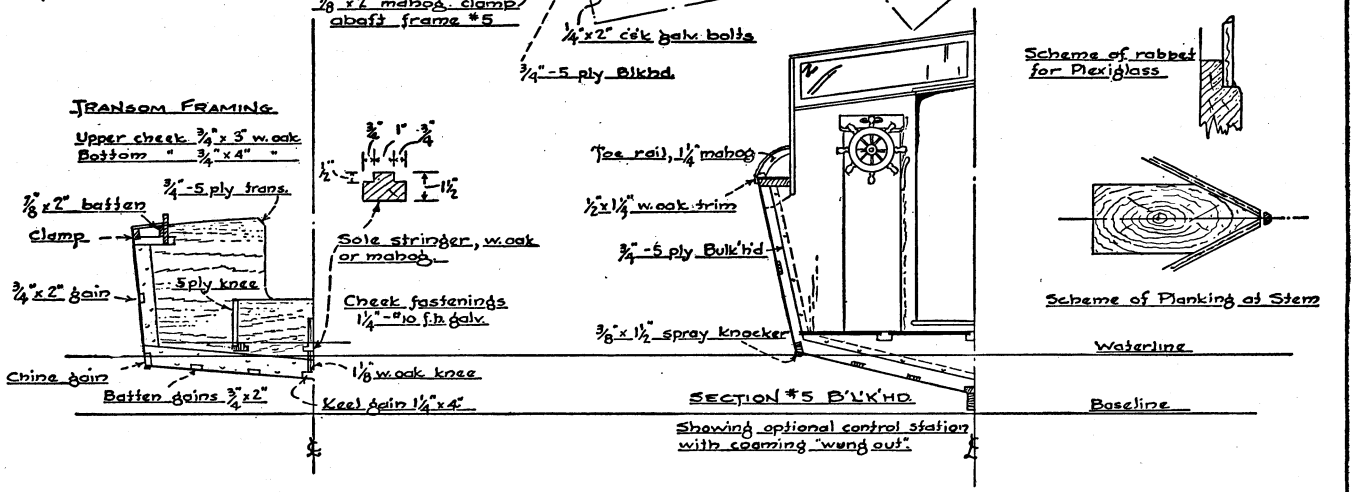
This exploded perspective shows the placement of hull members in relation to each other. Note that knees are lag-screwed to the motor apron of ¾" 5 ply, and then they go to the sole stringers.

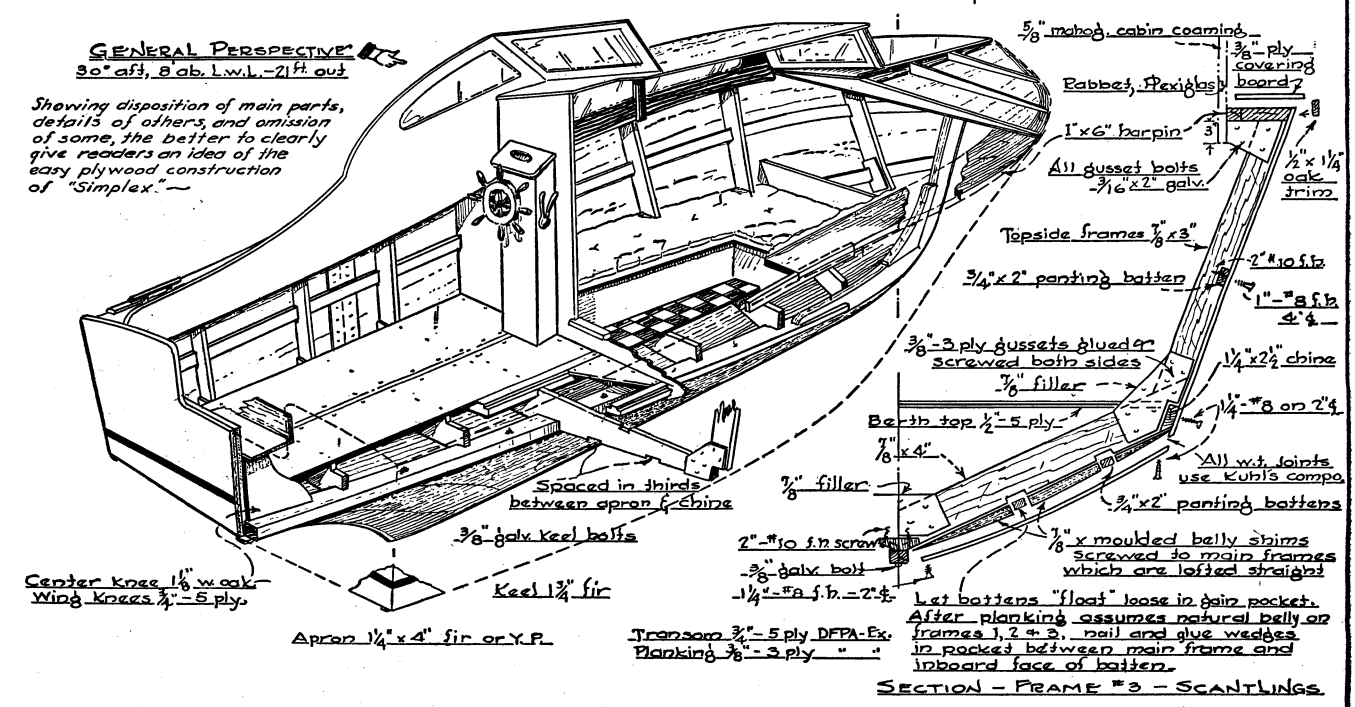


INBOARD PROFILE

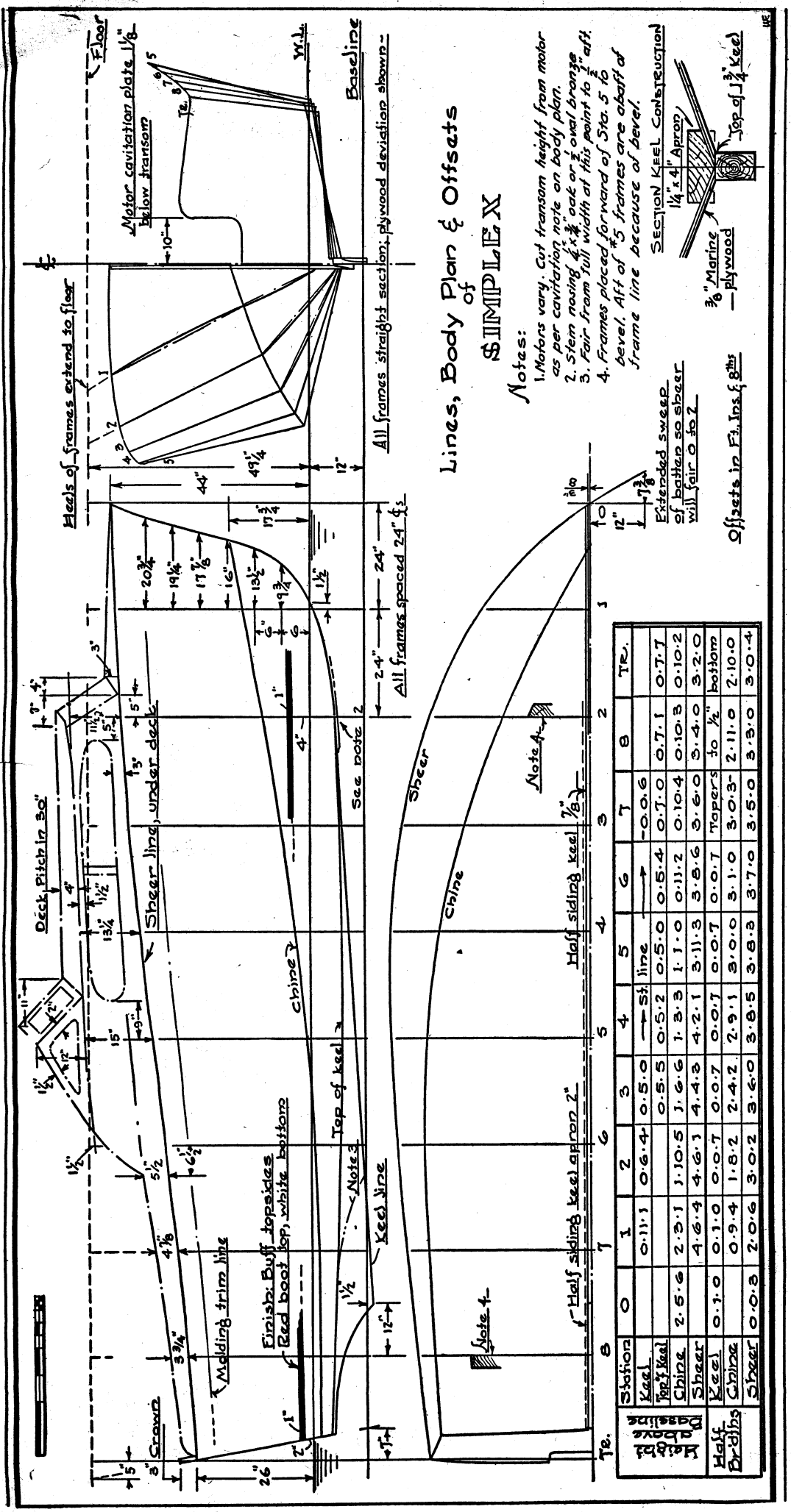








SECTION - FRAME #3 - SCANTLINGS.



The lines drawing off here to port must be laid down full size and faired up before any building is started. Subtract skin thicknesses!

panel itself—upward and outward?

The cabin deck deserves mention. It is pitched like the deck of a military car—no crown, no truffles—just a plain, flat-paneled "pitched roof." The foredeck is shown that way too. The British used this form on their light war vessels, and with a tight seam at the ridge, it works well. Certainly it is an easier form of construction to fit windshield and cabin headledge to.

All modern outboards have gear shift and reverse. These controls should be brought to the port bulkhead and into the control column which houses the marine-type steering wheel, and should be thence led under the port plankshеer or side deck to the motor. It will be easy to balance the thwartship weight of the cruis-a-day fuel tank with a storage battery from which the running lights and the cabin dome lights will be energized.

Marine law states that a white light aft, with fresnel (corrugated) lens be carried, and that a combination red and green fresnel light be lower and forward. This combination holds in any boat up to 26 feet long.

Above 26 ft., a white light must be carried forward between the red light to port (left) and the green light to starboard (right). Also adequate fire extinguisher, foghorn, and life preservers must be carried, as well as two copies of the U.S. Coast Guard Pilot Rules.

There is a toe rail on the deck edge which is sectioned. This is rounded on the outboard edge, and serves to give a somewhat streamlined appearance to the whole. About 1" from the transom, the rail is cut, leaving a space for rainwater to drain overboard.

And there, with the specs and fastening schedule that I have included in the drawings themselves, you have *Simplex* — good-looking, cheap, very easy to build, and a craft that will get you afloat and about until you begin to get the feel of yachting and until you know what sort of ship will really fill your bill. *Simplex* is an ideal beginning.

MODEL YOUR OWN

Dream Boat

By WESTON FARMER

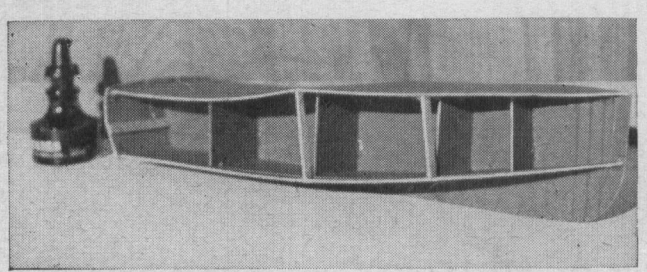
Dreaming of that boat that you hope to build some day? Then you can't afford to pass this up. It shows you how to make certain that you'll get the boat you want

BOAT-MINDED sportsmen usually have a "feel" for sweet curves and flowing lines. But they find it difficult to get these down on paper so that the boatbuilder may interpret what is wanted. Few laymen have the necessary professional skill to draw out a boat, calculate the weight, peg the proper waterline, and predetermine the performance. How, then, to get the boat you want out of dream stuff? How do you know how it will actually look and how it will perform? The method is easy.

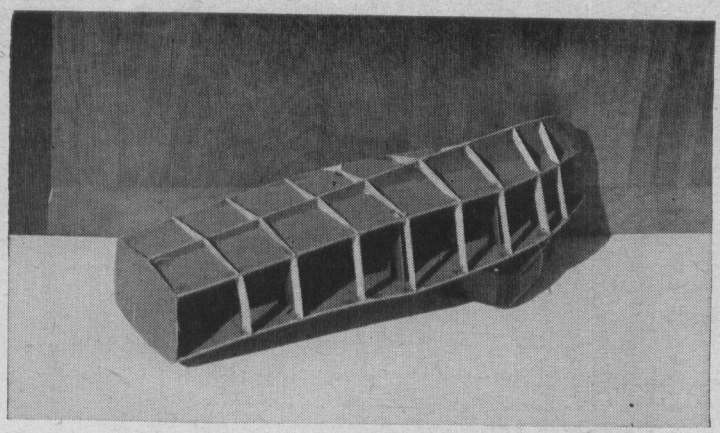
You model it. Anyone who can handle scissors and a tube of model-airplane cement can get, with the method I show here, a miniature of his boat which will show him how his dream ship is going to look and how it is going to perform.

First, you need a few simple materials. You need photo mounting board, a few sheets of 1/32" balsa, scissors, a couple tubes of Testor's fast-drying model airplane cement, some pins, some stiff-backed razor blades, a sheet of fine sandpaper and a small can of varnish. Two dollars will buy the works. A stationery store will supply the sheet of photo mounting board and a model-airplane supply store will provide the cement or "glue," pins, balsa and razor blades. Get the cardboard in the usual gray and blue-backed sheet. The balsa should be of the hard variety. Standard sheets are 1/32"x3" x24" and cost about 14 cents each.

Now you have your materials. The first two things you do are: cut out of the photo mounting board the outline of the deck (sheer) plan, and the outline of the boat in elevation, which is termed the outboard pro-



In this picture you see that the model has been glued up with airplane glue. The cardboard profile is glued to cardboard deck plan and sheer to chine spacers and the chine-line plane put in. The framing topside is begun. Study this photo.



Bottom and the topside framed in ready for the planking. All you need for the making of model is ability to handle a scissors and model cement.

file. See Fig. 1 in the accompanying drawing. This illustration shows what you are shooting for.

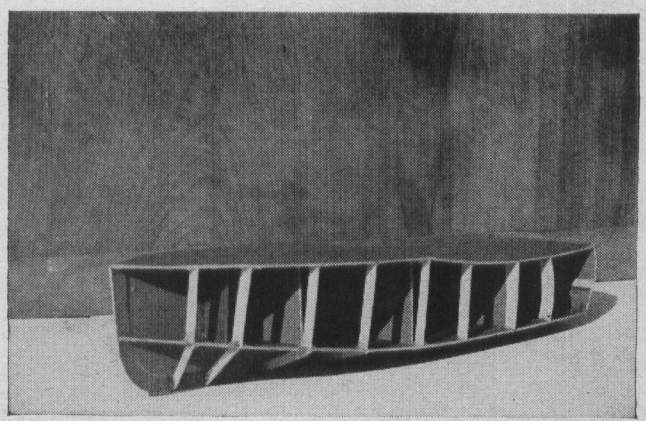
The profile will give you no trouble, but if you find it hard to sketch both sides of the boat symmetrically about the centerline in plan view, cut a separate template to one half the boat's shape, draw one side, then flop the pattern over about the center and draw the other side. This assures symmetry. Any small jogs in any curve usually are smoothed up by cutting when you use the scissors.

With a razor blade, cut partially through each face of these two pieces —the profile and the deck plan— about ¼ inch from the edge. The idea is to go part way through, but not quite; what we want is a piece of cardboard stiff enough to hold shape while cementing, but which will part company at the right place when we gut the falsework out of the model.

Next, as at Fig. 3, cut out some spacers for the chine-to-sheer height, assuming your boat is of V-bottom form. If of round-bilge form, forget this step. These spacers go between frame stations and are merely for temporary support of the chine plane.

In gluing the profile and the deck plan together, and in setting in the chine-to-sheer spacers, the technique to use is to hold the piece to be glued in the left hand, and with the tube of cement held in the right, pay a bead of cement out on the edge to be glued. It is like putting a ribbon of toothpaste on a brush.

The next step is to get out the chine planes. In a V-bottom boat the chine line is the hard knuckle where



In the picture above it is seen that the topside frames are all in and the bottom frames have been tacked on. This is a V-bottom model. This article will give you full details on the making of this model and all of the materials needed.

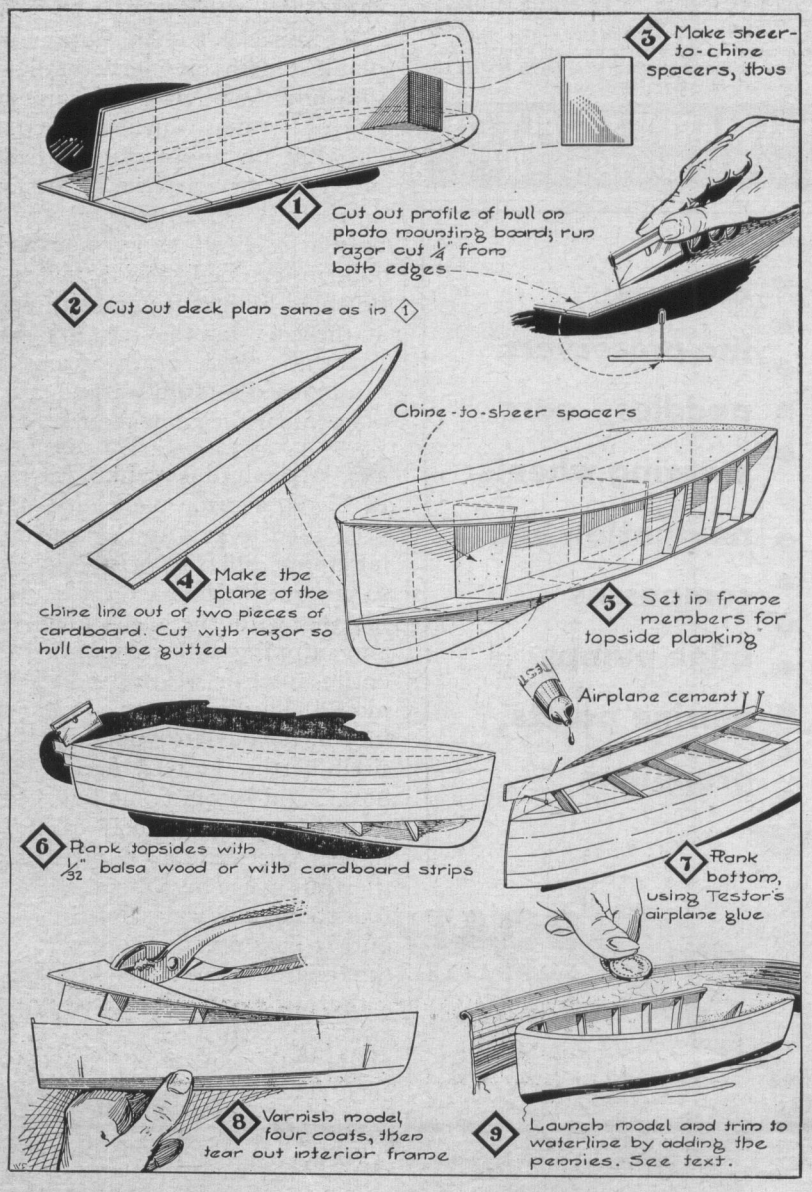
the topsides and knuckle meet. In most modeling, notches are cut in the frames and a small chine stringer is inserted. This method is not as satisfactory as is the method of containing the chine line in a plane of cardboard and bending it into place over the sheer-to-chine spacers. The chine-plane method assures symmetry and accurate flow to the line, something otherwise hard to get. Fig. 4 shows how these chine planes look, including the razor cut, and Fig 5 shows how they are installed.

Cut out the transom from cardboard and glue it in place. If you work in a dry room at about 70 degrees, the airplane cement will dry so it will hold in about one minute. It later sets up glass-hard, holding beautifully.

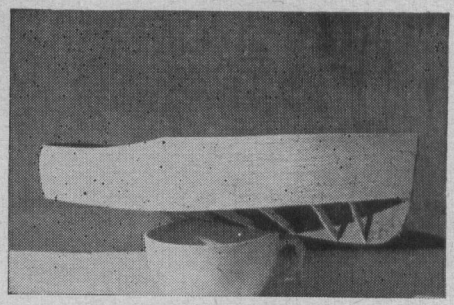
As shown in Fig 5, you proceed to frame up the topsides. Cut curved frames from cardboard, and use balsa for straight frames. The topsides are best framed first to avoid any propensity to warpage caused by the dope cement "pulling." The heads and heels of the frames are tacked with glue at the 1/4" strip which will stay in the boat. Avoid getting glue spread over the razor cut as this will make it hard to rip out the inboard falsework.

The next step is to plank the topsides as shown in Fig. 6, and the bot-

These steps given in the drawing below will explain themselves. If you follow them carefully, you will not have any trouble in obtaining a model that gives you an idea of your desired boat.



Here we see that the topside of the model is planked and trimmed. The bottom is planked in the same manner. It should be varnished before launching.



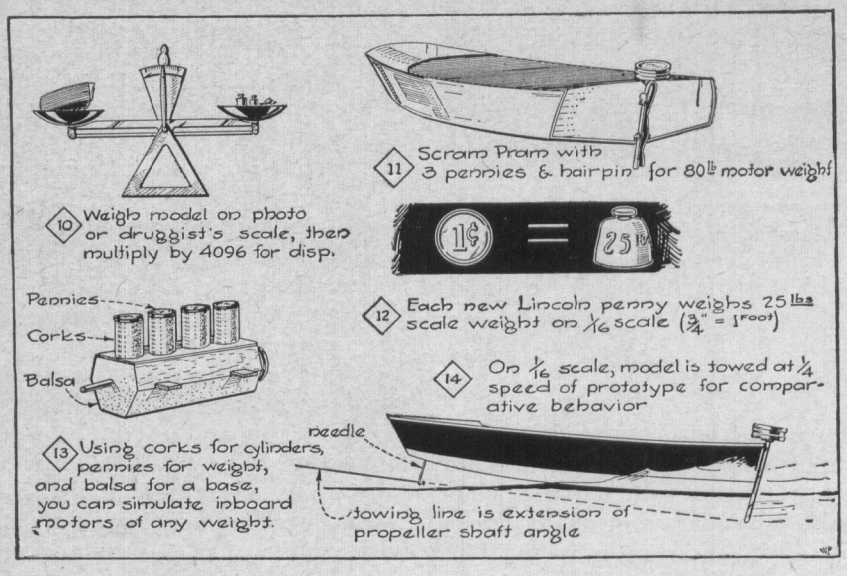
tom, as in Fig. 7. The ends of the balsa are shaved off as they pass the transom. Use a razor blade for this. It is a good plan, after the plank ends have been thus trimmed, to run a bead of cement over the raw end grain of the wood, and smear it flat with your finger tip, the better to provide a glue wrapping about the end of the plank.

Reasonably flat topsides may be planked with one sheet of balsa as shown in the photos. The same holds true of bottoms which are reasonably flat. But on any surface which has much sny, or warpage, strips should be used. The planking of a typical bottom is shown progressing in Fig. 7. Strips can be 1/4" wide, and should be glued both at frame landings and at the edges as they come together. In other words, at the seams. Pins can be used to hold warped strips in place until the cement dries.

NOW the hull is planked. As shown in Fig 8, a razor blade first having been used to pry up one end of the falsework, pliers or scissors are used to pry out the inboard falsework. By nicking with the razor blade here, and snipping with scissors there, the entire interior of the model is removed. This leaves you a hollow hull in which you later can build scale-sized berths, lockers, floors, engine boxes, and so on. Some naval architects who are extremely careful designers use scale-sized manikins so they can gauge headroom, elbow and foot room, and general utility of layout. It pays off. Very often it makes the difference between a klunker and a thoroughbred. The latter kind of boat, one with no bad traits, comes about rarely and is a result only of such close attention to little details.

Now the hull is lightly sanded and finished off. This is one of the main

Below is given the method for weighting your model properly so that you'll be able to judge her condition when boat's equipped with an engine. You may get some surprises now.



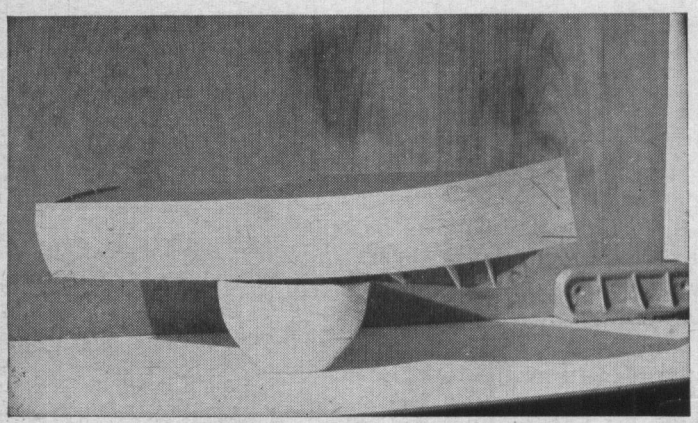
reasons balsa is used for planking. It sands and finishes easily. I have used cardboard, and it is perfectly all right, but finishing must be done by waterproofing with hot paraffin, and then scraping with a blunt table knife. Paraffin is not as satisfactory or as long-lived as varnish.

Four coats of varnish is the minimum necessary to really waterproof a model built on this system. Let each coat set up overnight. Do not sand the last two coats, but flow them generously.

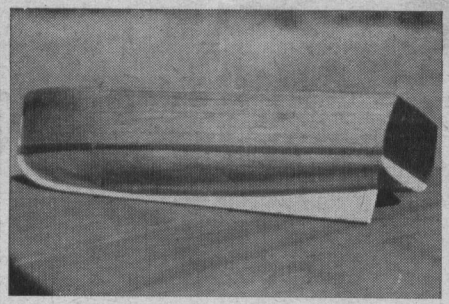
Now comes the launching! This and the testing for trim and wake pattern, are the pay-off where the real fun comes. And here I must get in a word or two about the simple mathematics of similitude.

There is a law in naval architecture which states that (within broad limits) the model of any vessel varies to the prototype as the square root of their linear ratios in the matter of speed, and as the cube of the linear ratios as to weight. Let us take an example to show you what is meant.

Suppose you have worked in the scale of 3/4" equals 1 foot. This is the scale most used by naval architects who use models, because it is one sixteenth full size, and the linear ratio, 16, is easy to cube and to extract



The step pictured here is the one where you are beginning to plank the topside. For the man who is planning to build a boat, the steps in the making of this model will be of great help. He will avoid serious errors in his boat.



In the photograph above you find the fully finished model of the round-bilge form ready for the launching. You will now be ready for testing of the model.

square root from. Your model is then one sixteenth full size. Its speed in scale proportion will be to the prototype as the square root of the linear ratio. The linear ratio is 16. The square root of 16 is 4. Therefore the model when towed will exhibit the wake and behavior of the prototype at one fourth the speed of the bigger vessel. If your prototype is to be powered for a speed of 16 miles an hour, tow the model at four miles an hour (a nice brisk walk at lake edge) and the behaviors will be similar. For a 40-mile prototype speed, one fourth of 40 being 10, a moderate running gait will give you 10 miles an hour and similarity.

Because these towing speeds so readily lend themselves to a gait a man can achieve on his own legs, the scale $\frac{3}{4}$" to 1 foot is most useful.

As to displacement, or weight, the scale varies as the cube of the linear ratio, or, on $\frac{3}{4}$" scale, as 16 times 16 times 16. This is 4,096. Therefore, if your model, after trimming to waterline, weighs one pound, the finished prototype will weigh 4,096 times 1 or 4,096 pounds.

After launching your model, a most convenient form of ballast is multiples of the Lincoln penny, which scales out very close to 25 pounds scale weight in $\frac{3}{4}$" scale. By adding pennies until you reach the waterline trim, and gunking these pennies into permanent place by flowing a bead of cement over them, the model, after being removed from the water and dried, can be both weighed and balanced. Where the model balances will be the fore-and-aft position of the center of buoyancy, much more accurately arrived at this way than by Simpson's rules of calculation. The center of buoyancy and center of gravity always coincide in a fore-and-aft relationship.

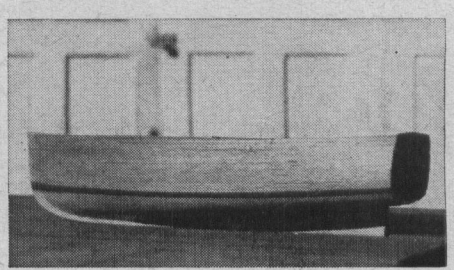
After ballasting, weigh your model on a photo scale or on a druggist's balance. There are 16 ounces in a pound, and 480 grains in an ounce, troy weight. Thus, the total weight of the model in pounds, ounces and grains can be converted to pounds and decimals of a pound, multiplied by 4,096 and presto! you have the weight of the prototype. The method is quite accurate.

Thus both the wake pattern and the total displacement of the prototype as well as the location of the buoyancy center and gravity center are made known by modeling.

Figs. 9, 10 and so on show the launching and weighing, and give suggestions whereby engines of different weights may be simulated with pennies, balsa, corks and pins.

As to towing methods: it is important, in order to simulate the proper thrust components, to extend the towing cord in the same angle as the propeller shaft. A needle is shown in the last drawing of the series, through the eye of which a silk thread is knotted. The towing operator then keeps the towing line at an extension of the shaft angle. In tank work the towing thrust is usually applied at the thrust block, but this is not practicable for our simple experiments.

A self-integrating model shows up errors in basic premises if there are any. To the skilled, the best method of arriving at the ultimate dream boat is to carry both calculations and model along together. To the sportsman not concerned with theory, the model will show him more in a few days' time than a whole library possibly could. He is taking his answers from the boat and the water itself. Together they are infallible.



Another view of round-bilged model—fully planked with the balsa strips and varnished—and ready for its launching. Compare the text with these photos.

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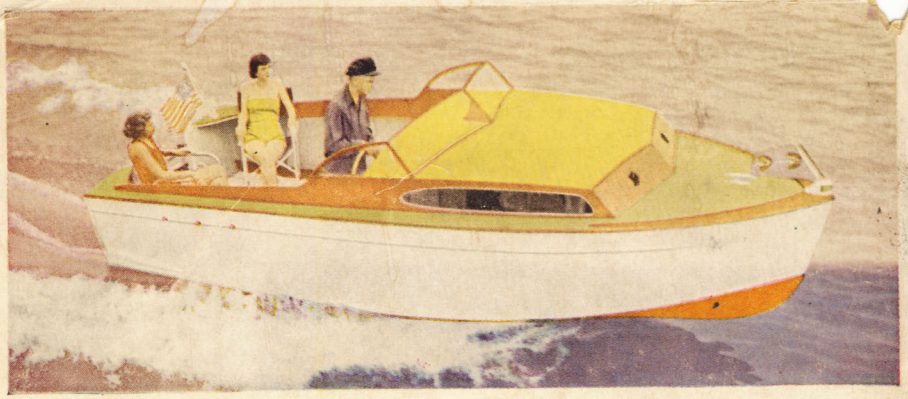

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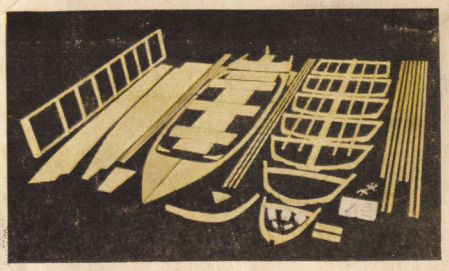

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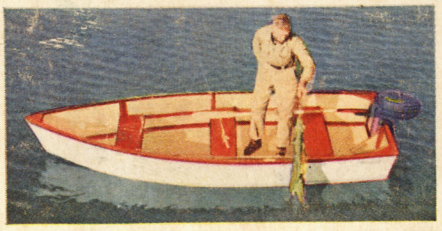

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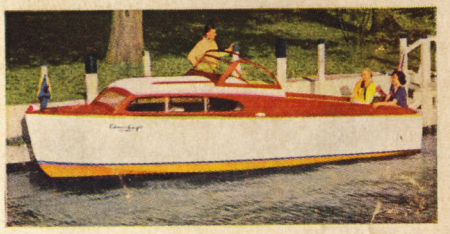

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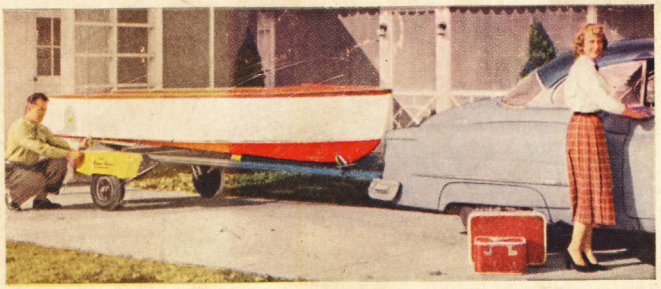

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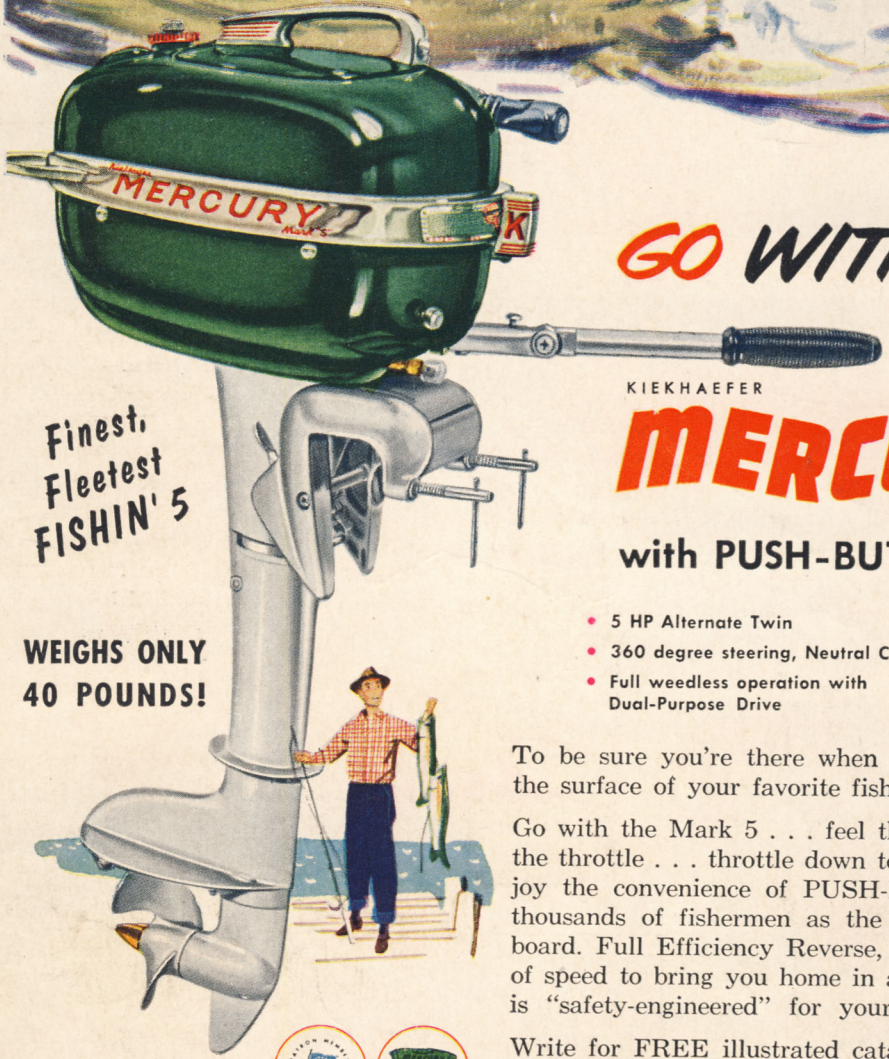

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